

**CLASS 508, SOLID ANTI-FRICTION DEVICES, MATERIALS THEREFOR, LUBRICANT OR SEPARANT COMPOSITIONS FOR MOVING SOLID SURFACES, AND MISCELLANEOUS MINERAL OIL COMPOSITIONS**

**SECTION I - CLASS DEFINITION**

This class is an integral part of Class 252, as shown by the position of the box identifying this class in the Class 252 schedule. As such, this class is subject to the Class Definition and Notes of Class 252.

**A. GENERAL STATEMENT**

Patents which contain a claim to a lubricant composition are placed in this Class as original patents, and are cross-referenced wherever necessary or desirable. Patents which disclose the use of claimed compositions as lubricants, and recite no claims to a use provided for elsewhere, are similarly classified in this Class. If no composition claims limited to a specific use are recited, and plural utilities are disclosed, or if composition claims to plural utilities are recited, reference should be made to the superiority listing in the (5) note of the Class 252 Definition to determine the original classification of the patent.

This class provides for:

- (1) compositions of matter which are solid antifriction devices or articles described in terms of their chemical composition,
- (2) materials from which said solid antifriction devices or articles are fashioned,
- (3) compositions which serve as lubricants or separants for moving solid surfaces,
- (4) compositions of mineral oils admixed with non-hydrocarbon materials and not limited to a function or utility provided for elsewhere in Class 252 or any other class.

**B. DETAILED STATEMENT**

- (1) The solid antifriction devices or articles described in terms of their chemical composition are characterized by having a lubricant material as a permanent part of the article or device. This permanence may be accomplished by permanent coating, impregnation into the interstices of the article or device, or by being part of the composition of matter from which the article or device

is fashioned. The articles and devices are further characterized by retention of their shape during use.

The type of solid antifriction article or device provided for herein is exemplified by: bearings, rings, seals, journal boxes, bushings, brakes, clutches, gun wads, or liners for bearings, brakes or clutches.

Any processes of making such solid antifriction articles or devices, or peculiar to making such articles or devices, for which there is no provision elsewhere are provided for herein.

Mere or nominal use of such solid antifriction articles or devices as lubricating elements is provided for herein, if there is no provision elsewhere.

- (2) The discussion of solid antifriction articles and devices in the Detailed Statement, paragraph 1, *supra*, is generally applicable also to the materials from which these articles and devices are fashioned.

The materials provided for herein from which said solid antifriction articles or devices are made are the aggregate materials, not individual components of the materials or anything less than the entirety of the material suitable to be fashioned into said article or device.

- (3) The lubricant or separant compositions for moving solid surfaces provided for herein may be liquid, plastic, or fluent compositions specialized and designed for use between two relatively moving surfaces and in contact therewith for reducing friction therebetween or preventing said surfaces from contacting each other. The compositions must include at least one component that is not a hydrocarbon (except if the hydrocarbon is a solid synthetic polymer).

Any process of making such compositions, or peculiar to making such compositions, for which there is no provision elsewhere is provided for herein.

- (4) This class is the generic home for mineral oils admixed with non-hydrocarbon materials and not limited to a function or utility provided for elsewhere in Class 252 or any other class. Examples of such compositions are mineral oils mixed with antioxidants, corrosion inhibitors, gum inhibitors, stabilizers, etc.

**SECTION II - NOTES TO THE CLASS DEFINITION**

- (1) Note. Components of compositions, if described purely in functional terms such as “antioxidant,” “VI improver,” etc., will not be considered as determinative of classification. In other words, one should not classify a claim in a particular subclass of this class by referring to the specification for the chemical structure identity of a component described in the claims in purely functional language. If the claims of a patent are devoid of chemical structure for the components of a composition, the original classification of the patent will be subclass 200 or subclass 220, assuming that the patent claims are not provided for in another class or classes.

- (2) Note. Mere or nominal methods of use of a chemical compound as a lubricant or separant within the meaning of the class definition are classified in this class.

- (3) Note. When the term “hydrocarbon” is used in this class, it means an organic compound which consists exclusively of carbon and hydrogen.

- (4) Note. When a component of a composition classified in this Class (508) is of indeterminate chemical structure, the following principles shall apply to the classification thereof:

(a) a number of subclasses herein provide for components of a composition described in terms of their being reaction products of indeterminate structure derived from the reaction of a particular type compound of known structure.

(b) a composition component of indeterminate structure that can not be classified as described in (a), supra, shall be classified by considering two additional possible methods for classifying it and employing the one which results in the highest classification in the class. The two methods are: (1) Classify according to a partial structure known to be part of the component. (2) Classify based on a reactant utilized to make the component, and place in the highest reactant classification, with priority given to organic reactants. If no organic

reactants are used, classify based on the highest inorganic reactant classification.

### SECTION III - LINES WITH OTHER CLASSES AND WITHIN THIS CLASS

- (1) Note. When the expression “organic compound” is used in this class, it means a compound which meets the requirements of the Class 260 class definition, i.e., the molecule is characterized by two carbons bonded together, one atom of carbon bonded to at least one atom of hydrogen or halogen, or one atom of carbon bonded to at least one atom of nitrogen by a single or double bond. Certain compounds are exceptions to this rule, i.e., HCN, CN-CN, HNCO, HNCS, cyanogen halides, cyanamide, fulminic acid and metal carbides. Said exceptions and all other chemical compounds shall be regarded as inorganic.

- (2) Note. The organic chemical structure terminology used in this class is consistent with that used in the Glossary for the Class 532 - Organic Compounds - part of the Class 532-570 Series (Published May 22, 1984 in Addendum No. 1-Order No. 946) except as otherwise noted.

- (3) Note. The rules for determining Class placement of the Original Reference (OR) for claimed chemical compositions are set forth in the Class Definition of Class 252 in the section LINES WITH OTHER CLASSES AND WITHIN THIS CLASS, subsection COMPOSITION CLASS SUPERIORITY, which includes a hierarchical ORDER OF SUPERIORITY FOR COMPOSITION CLASSES.

### SECTION IV - REFERENCES TO OTHER CLASSES

#### SEE OR SEARCH CLASS:

- 29, Metal Working, subclass 404 for a process of breaking in an engine using a break-in lubricant.
- 44, Fuel and Related Compositions, subclasses 300+ particularly (5) Note to subclass 300 for the line between Class 44 and this class (252).

- 75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, appropriate subclasses for a bearing containing a continuous phase of metal made by consolidating metal particles, particularly subclass 231 for such a bearing containing molybdenum disulfide or other solid or other solid lubricant.
- 102, Ammunition and Explosives, particularly subclass 511 for such devices embodying lubricants wherein there is claimed the structure of the device which is more than a mere recitation of the composition or of a carrier including a lubricant.
- 106, Compositions: coating or Plastic, subclasses 38.2 through 38.9 for compositions used in preparing molds and in coating molds. These subclasses have not been exhaustively screened for patents which meet the definition of this Class 508; a search of these subclasses may thus be appropriate to ensure a complete search.
- 148, Metal Treatment, subclasses 206 through 238 for carburizing or nitriding metal substrates using externally supplied carbon or nitrogen, subclasses 240-287 for processes of reactive coating of a metal substrate, particularly subclass 246 wherein the reactive coating composition contains a lubricant, and subclasses 316-319 for carburized or nitrided metal stock. These subclasses have not been exhaustively screened for patents which meet the definition of this Class 508; a search of these subclasses, in particular subclasses 316-319, may thus be appropriate to ensure a complete search.
- 184, Lubrication, for lubricating processes or apparatus.
- 208, Mineral Oils: Processes and Products, subclasses 14+ for compositions consisting of mineral oils or mixtures thereof, regardless of the use or function, as for example, fuels, lubricating oils, etc.
- 252, Compositions, subclasses 71+ for similar compositions which are heat exchange, low freezing or pour point or high boiling.
- 252, Compositions, subclasses 570+, for fluent dielectric compositions ("insulating oils") which contain a hydrocarbon and a nonhydrocarbon.
- 384, Bearings, appropriate subclasses for bearings that include lubricants and significant structure of the bearing. Bearings that include lubricants when claimed solely in terms of the composition of which they are composed are classified in this class (Class 252).
- 420, Alloys or Metallic Compositions, appropriate subclasses for a bearing distinguished solely by its alloy or metallic composition.
- 516, Colloid Systems and Wetting Agents; Subcombinations Thereof; Processes of Making, Stabilizing, Breaking, or Inhibiting, appropriate subclasses for subject matter relating to: colloid systems (such as sols\*, emulsions, dispersions, foams, aerosols, smokes, gels, or pastes) or wetting agents (such as leveling, penetrating, or spreading); subcombination compositions of colloid systems containing at least an agent specialized and designed for or peculiar to use in making or stabilizing colloid systems; compositions and subcombination compositions specialized and designed for or peculiar to use in breaking (resolving) or inhibiting colloid systems; processes of making the compositions or systems of the class; processes of breaking (resolving) or inhibiting colloid systems; in each instance, when generically claimed or when there is no hierarchically superior provision in the USPC for the specifically claimed art.
- 520, Synthetic Resins or Natural Rubbers, appropriate subclasses, particularly Class 523, subclasses 149+ for a composition containing a synthetic resin or natural rubbers having utility as a friction element or to processes of preparing said composition.
- 585, Chemistry of Hydrocarbon Compounds, subclasses 1+ for a composition consisting only of hydrocarbons, regardless of the use or function, as for example, fuels, lubricating oils, etc. Such hydrocarbons may not be solid synthetic polymers.

#### SUBCLASSES

- 100 SOLID ANTIFRICTION DEVICE, ARTICLE OR MATERIAL THEREFOR (i.e., SHAPED SOLID ARTICLES WHICH RETAIN THEIR SHAPE DURING USE, SUCH AS BEARINGS, RINGS, SEALS, JOURNAL BOXES, BUSHINGS, BRAKES, CLUTCHES, GUN WADS, JOURNAL BEARINGS, OR LINERS FOR BEARINGS, BRAKES OR CLUTCHES, OR MATERIAL THEREFOR, WHEREIN A LUBRICANT IS A PERMANENT PART**

**OF THE SOLID ANTIFRICTION DEVICE, ARTICLE OR MATERIAL, WHETHER BY PERMANENT COATING, IMPREGNATION INTO THE INTERSTICES THEREOF, OR BY BEING PART OF THE COMPOSITION) (E.G., SYNTHETIC RESIN TYPE SOLID ANTIFRICTION DEVICES, ETC.):**

This subclass is indented under the class definition. Antifriction devices, articles or materials therefor under the ... which, in the case of the articles or devices, are: (1) solid, (2) shaped, (3) shape-retaining during use and (4) characterized by having a lubricant substance as a permanent part of the device or article, which permanence may be accomplished by permanent coating, impregnation into the interstices thereof, or by being part of the composition from which the article or device is fashioned; the materials therefor are the aggregate materials which differ from the articles or devices only in that they have not been shaped.

- (1) Note. This subclass and its indents provide for a backing which is coated with a layer of lubricating substance, provided that not enough structure is recited to warrant classification elsewhere.
- (2) Note. This subclass and its indents provide for a backing which is coated with plural layers only if (a) each layer is a lubricant layer, and (b) not enough structure is recited to warrant classification elsewhere.
- (3) Note. This subclass and its indents provide for articles, devices or materials therefor wherein a composition containing metal powder is sintered, compacted or compressed, only if a lubricant substance is (1) layered or (2) impregnated on or into the composition after the composition is sintered, compacted or compressed.

**SEE OR SEARCH CLASS:**

- 148, Metal Treatment, subclasses 206 through 238 for carburizing or nitriding metal substrates using externally supplied carbon or nitrogen, subclasses 240-287 for processes of reactive coating of a metal substrate, particularly subclass 246 wherein the

reactive coating composition contains a lubricant, and subclasses 316-319 for carburized or nitrided metal stock. These subclasses have not been exhaustively screened for patents which meet the definition of this Class 508; a search of these subclasses, in particular subclasses 316-319, may thus be appropriate to ensure a complete search.

**101 Animal or plant matter (e.g., blood, hair, skin, wood, hemp, cotton, paper, lard, castor oil, shellac, glue, beeswax, etc.):**

This subclass is indented under subclass 100. Devices, articles, or materials which contain animal or plant matter.

**102 With graphite or elemental carbon:**

This subclass is indented under subclass 101. Devices, articles, or materials which contain, in addition to the animal or plant matter, elemental carbon or graphite.

**103 Elemental or alloyed metal:**

This subclass is indented under subclass 100. Devices, articles, or materials which contain elemental metal or alloyed metal.

**104 With fluorine compound:**

This subclass is indented under subclass 103. Devices, articles, or materials which contain, in addition to the elemental or alloyed metal, a fluorine compound.

**105 With graphite, coal, or elemental carbon:**

This subclass is indented under subclass 103. Devices, articles, or materials which contain, in addition to the elemental or alloyed metal, elemental carbon, coal or graphite.

**106 Halogen compound:**

This subclass is indented under subclass 100. Devices, articles, or materials which contain a halogen compound.

**107 Silicon compound:**

This subclass is indented under subclass 100. Devices, articles, or materials which contain a silicon compound.

**108 Heavy metal or aluminum compound (e.g., MoS<sub>2</sub>, etc.):**

This subclass is indented under subclass 100. Devices, articles, or materials which contain a heavy metal compound or an aluminum compound.

- (1) Note. Arsenic is considered a heavy metal.
- (2) Note. Heavy metals are those whose specific gravity is greater than 4.0.

**109 Graphite, coal, or elemental carbon:**

This subclass is indented under subclass 100. Devices, articles, or materials which contain elemental carbon, coal, or graphite.

**110 LUBRICANTS OR SEPARANTS FOR MOVING SOLID SURFACES AND MISCELLANEOUS MINERAL OIL COMPOSITIONS (E.G., WATER CONTAINING, ETC.):**

This subclass is indented under the class definition. Compositions which are miscellaneous mineral oil compositions, or are lubricants or separants for moving solid surfaces.

- (1) Note. Compositions classifiable in this subclass contain at least one component that is not a hydrocarbon (except as a solid synthetic polymer) or a mineral oil.
- (2) Note. This subclass and its indents provide not only for compositions of lubricants, per se, but also for compositions of additives intended to enhance the lubricating properties of a lubricant base. An example of such an additive composition is a viscosity improving additive composition.
- (3) Note. Since additives to lubricant compositions may serve more than a single purpose, the primary basis of classification for this subclass and its indents is the chemical structure of the nonhydrocarbon ingredients of the composition.
- (4) Note. In classifying compositions in this and indented subclasses, all ingredients intentionally present in the composition are given equal weight for purposes of

classification without regard to the amount present or whether the component is a lubricant additive or lubricant base.

- (5) Note. An example of a composition provided for herein is an emulsion of a hydrocarbon oil and water.

**111 Processes of purifying or recovering used lubricant compositions, and purified or recovered products thereof:**

This subclass is indented under subclass 110. Processes which are directed to the chemical or physical treatment of used lubricant compositions of this class for the purpose of purification or recovery, or to lubricant compositions described in terms of a method of purification or recovery thereof after use.

- (1) Note. To be classified herein, the process can not simply be for the purification or recovery of a mineral oil or hydrocarbon lubricating base. The composition whose purification or recovery is desired must include at least one component that is not a hydrocarbon (except if the hydrocarbon is a solid synthetic polymer).

**SEE OR SEARCH CLASS:**

- 208, Mineral Oils: Processes and Products, various subclasses, for the purification and recovery of mineral oils, per se.
- 585, Chemistry of Hydrocarbon Compounds, subclasses 800+, for the purification and recovery of mixtures of hydrocarbons that are neither mineral oils nor solid synthetic polymers.

**112 Halogenated graphite, or microorganism metabolic product or culture product of indeterminate structure:**

This subclass is indented under subclass 110. Compositions which contain a product of indeterminate structure resulting from a microorganism culture medium or from a microorganism's metabolic process, or which contain halogenated graphite.

- (1) Note. Examples of components provided for herein are fluorinated graphite, and the indeterminate product of yeast fer-

mentation of a water, wood-pulp, rye-meal, and glue mixture.

**113 Graphite, coal, or elemental carbon:**

This subclass is indented under subclass 110. Compositions which contain elemental carbon, coal or graphite.

**SEE OR SEARCH CLASS:**

516, Colloid Systems and Wetting Agents; Subcombinations Thereof; Processes of Making, Stabilizing, Breaking, or Inhibiting, subclass 32 for colloid systems of colloid-sized carbon (e.g., diamond, graphite) dispersed in primarily organic continuous liquid phase, subclasses 38+ for colloid systems of colloid-sized bituminous, coal, or Carbon phase dispersed in aqueous continuous liquid phase, cross-reference 901 for colloid systems of substantially pure elemental carbon (graphite, lamp black, carbon black, fullerenes); or agents for such systems or making or stabilizing such systems or agents; in each instance, when generically claimed or when there is no hierarchically superior provision in the USPC for the specifically claimed art.

**114 With silk, sponge, hair, skin, leather, meat, or fibrous plant matter (e.g., cork, bamboo, bark, sawdust, cotton, etc.):**

This subclass is indented under subclass 113. Compositions which contain, in addition to the graphite, coal, or elemental carbon, at least one of fibrous plant matter, meat, leather, skin, hair, sponge or silk.

- (1) Note. Meat is intended to indicate the flesh of animals.
- (2) Note. Sponge is intended to encompass natural sponge, or synthetic sponge which is identified as sponge rather than as a particular chemical substance. If a component is identified both as sponge and in terms of its chemical structure, said component should be classified as an original here and should be cross-referenced to the appropriate chemical structure subclass.

(3) Note. Hair is intended to encompass the fine, threadlike outgrowths from the skin of an animal; skin is intended to encompass the outer covering or integument of an animal body.

(4) Note. Fibrous plant matter indicates plant matter in which the plant fibers have not been destroyed.

(5) Note. Chemically modified cellulose (e.g. CMC, cellulose ethers, etc.) is not considered as fibrous plant matter.

**115 With naturally occurring resin, salt thereof, agar, natural rubber, tar, pitch, animal glue, turpentine, or carbohydrate gum:**

This subclass is indented under subclass 113. Compositions which contain, in addition to the graphite, coal or elemental carbon, at least one of carbohydrate gum, turpentine, animal glue, pitch, tar, natural rubber, agar, naturally occurring resins, or salts of naturally occurring resins.

(1) Note. For the definition of naturally occurring resin, see the definition of subclass 200 in Class 530, Chemistry: Natural Resins or Derivatives; Peptides or Proteins: Lignins or Reaction Products Thereof.

(2) Note. Animal glue is intended to encompass the normally impure animal matter of proteinaceous nature which found early use as an adhesive, etc. A substance identified as "glue", without further elucidation, will be construed as animal glue.

(3) Note. Carbohydrate gum is intended to encompass the complex carbohydrate mucilaginous plant stem excretions which normally yield sugar on hydrolysis. Examples are gum arabic and gum tragacanth. A substance identified as gum, without further elucidation, will be construed as carbohydrate gum.

(4) Note. Tar and pitch are generally considered as mineral oils for purposes of classification.

## SEE OR SEARCH CLASS:

208, Mineral Oils: Processes and Products, especially subclasses 18+ for lubricating compositions which are mixtures of mineral oils only.

**116 With organic -C(=O)O- compound:**

This subclass is indented under subclass 113. Compositions which contain, in addition to the graphite, coal, or elemental carbon, an organic -C(=O)O- compound.

- (1) Note. An organic -C(=O)O- compound is one in which the carbon of the -C(=O)O- is, or is attached directly or indirectly by nonionic bonding to, the carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- (3) Note. An example of a component provided for herein is castor oil.

**117 Phosphorus, nitrogen, or halogen attached directly or indirectly to the -C(=O)O- group by nonionic bonding:**

This subclass is indented under subclass 116. Compositions wherein the -C(=O)O- group is attached directly or indirectly to phosphorus, nitrogen, or halogen by nonionic bonding.

- (1) Note. Examples of components provided for herein are (1) vinyl pyrrolidone-hexyl methacrylate copolymers and (2) lecithin.

**118 The organic -C(=O)O- compound is a polymer resulting from polymerization of an olefinic double bond (e.g., ethylene-vinyl acetate copolymer, polyacrylate, etc.):**

This subclass is indented under subclass 116. Compositions wherein polymerization of an olefinic double bond in a monomer containing the -C(=O)O- group affords the organic -C(=O)O- compound.

**119 The organic -C(=O)O- compound is sulfurized, or elemental sulfur is present (e.g., sulfurized sperm oil, etc.):**

This subclass is indented under subclass 116. Compositions wherein (1) elemental sulfur is present in addition to the organic -C(=O)O- compound and the graphite, coal, or elemental carbon, or (2) the organic -C(=O)O- compound present is sulfurized.

- (1) Note. Sulfurized compounds are generally the result of reaction of sulfur or sulfur chloride with the original compound.
- (2) Note. An example of a component provided for herein is sulfurized sperm oil.

**120 The organic -C(=O)O- compound is a naturally occurring carboxylic acid ester wax, or a reaction product thereof of indeterminate structure (e.g., beeswax, spermaceti, lanolin, degreas, Japan wax, etc.):**

This subclass is indented under subclass 116. Compositions wherein the organic -C(=O)O- compound is (1) a reaction product of a naturally occurring carboxylic acid ester wax, which product is of indeterminate structure, or (2) a naturally occurring carboxylic acid ester wax, per se.

**121 With boron or silicon compound:**

This subclass is indented under subclass 116. Compositions which contain, in addition to the organic -C(=O)O- compound and the graphite, coal or elemental carbon, a compound which contains boron or silicon.

- (1) Note. Example of components provided for herein are borax and silica.

**122 The organic -C(=O)O- compound is a carboxylic acid or salt thereof, or inorganic base is present with the organic -C(=O)O- compound:**

This subclass is indented under subclass 116. Compositions wherein (1) inorganic base is present in addition to the organic -C(=O)O- compound and the graphite, coal, or elemental carbon, or (2) the organic -C(=O)O- compound is a carboxylic acid or salt thereof.

- (1) Note. An example of a component provided for herein is zinc stearate.

- 123 With elemental or alloyed metal:**  
This subclass is indented under subclass 113. Compositions which contain, in addition to the graphite, coal, or elemental carbon, an elemental metal or a metal alloy.
- 124 With silicon compound:**  
This subclass is indented under subclass 123. Compositions which contain, in addition to the elemental metal or metal alloy and the graphite, coal, or elemental carbon, a compound that contains silicon.
- 125 With boron compound or elemental sulfur:**  
This subclass is indented under subclass 113. Compositions which contain, in addition to the graphite, coal, or elemental carbon, a boron compound or elemental sulfur.
- 126 With silicon compound:**  
This subclass is indented under subclass 113. Compositions which contain, in addition to the graphite, coal, or elemental carbon, a compound that contains silicon.
- 127 With non-silicon inorganic compound (except water):**  
This subclass is indented under subclass 126. Compositions which contain, in addition to the silicon compound and the graphite, coal, or elemental carbon, an inorganic compound (excluding water) that does not contain silicon.
- (1) Note. See Notes to the Class Definition for the definition of organic compound. Any chemical compound not regarded as organic therein shall be considered inorganic.
- (2) Note. Water may be present as a component herein, providing that a further non-siliceous inorganic compound is present.
- 128 With organic sulfur, phosphorus, or nitrogen compound:**  
This subclass is indented under subclass 113. Compositions which contain, in addition to the graphite, coal, or elemental carbon, an organic nitrogen compound, an organic phosphorus compound, or an organic sulfur compound.
- (1) Note. An organic nitrogen compound is one in which nitrogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound. Organic phosphorus compounds and organic sulfur compounds are similarly defined.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 129 With inorganic compound (except water):**  
This subclass is indented under subclass 113. Compositions which contain, in addition to the graphite, coal or elemental carbon, an inorganic compound (except water).
- (1) Note. Water may be present as a component herein, provided that an additional inorganic compound is present.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound. Any chemical compound not regarded as organic therein shall be considered inorganic.
- 130 With organic oxygen or halogen compound:**  
This subclass is indented under subclass 113. Compositions which contain, in addition to the graphite, coal, or elemental carbon, an organic oxygen compound or an organic halogen compound.
- (1) Note. An organic oxygen compound is one in which oxygen is attached directly or indirectly by nonionic bonding to carbon of an organic compound. Organic halogen compounds are similarly defined.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 131 With synthetic polymer (e.g., ethylene-propylene copolymer, etc.):**  
This subclass is indented under subclass 113. Compositions which contain, in addition to the graphite, coal, or elemental carbon, a polymer prepared by synthetic means.

**132 Tar, tar distillate, or chemically reacted tar or tar distillate:**

This subclass is indented under subclass 110. Compositions which contain a chemically reacted tar, a chemically reacted tar distillate, a tar distillate, or tar.

- (1) Note. Tar and tar distillate are generally considered as mineral oils.
- (2) Note. An example of chemically reacted tar provided for herein is sulfurized tar.

**SEE OR SEARCH CLASS:**

208, Mineral Oils: Processes and Products, especially subclasses 18+ for lubricant compositions which are mixtures of mineral oils only.

**133 Asphalt, pitch, pitch distillate, or chemically reacted asphalt or pitch (e.g., sulfurized, salified, reduced, blown, etc.):**

This subclass is indented under subclass 110. Compositions which contain chemically reacted asphalt, chemically reacted pitch, pitch distillate, pitch, or asphalt.

- (1) Note. Pitch, pitch distillate, and asphalt are generally considered as mineral oils.

**SEE OR SEARCH CLASS:**

208, Mineral Oils: Processes and Products, especially subclasses 18+ for lubricant compositions which are mixtures of mineral oils only.

**134 With carboxylic acid or salt thereof:**

This subclass is indented under subclass 133. Compositions which contain, in addition to the asphalt, pitch, pitch distillate, or chemically reacted asphalt or pitch, a carboxylic acid or salt thereof.

- (1) Note. An example of a component provided for herein is lead naphthenate.

**135 Distillation residues of crude chemical reaction mixtures, or such residues chemically reacted (e.g., oxo still bottoms, etc.):**

This subclass is indented under subclass 110. Compositions which contain residues from distillation of crude chemical reaction mixtures,

or the chemical reaction products of such residues.

- (1) Note. The reaction of carbon monoxide, olefin, and hydrocarbon is referred to as the "oxo" reaction. Desired products are generally removed from the reaction mixture by a distillation process. The residue remaining in the still pot after distillation, a mixture of diverse compounds, is an example of the materials encompassed by this subclass.

**136 Silicon dioxide, silicic acid, orthosilicate, or metasilicate, including surface-treated (e.g., clays, onium clays, estersils, etc.):**

This subclass is indented under subclass 110. Compositions which contain silicon dioxide, silicic acid, orthosilicate, or metasilicate; these materials may be present either per se or in a surface-treated state.

- (1) Note. Surface-treated encompasses both physical and chemical surface treatment. Silicon dioxide, e.g., may be simply coated, or its outer layer may be made to chemically react with a surface treating agent.
- (2) Note. Silicon dioxide is also known as silica,  $\text{SiO}_2$ .
- (3) Note. Silicic acids encompass inorganic compounds wherein silicon is bonded directly to a hydroxyl group.
- (4) Note. An inorganic compound is any compound not specified to be organic in (3) Note of the class definition.
- (5) Note. Orthosilicates ( $\text{M}_4\text{SiO}_4$ ) and metasilicates ( $\text{M}_2\text{SiO}_3$ ) may combine to form polysilicates, M being metal or in some cases ammonium. They are salts derived from silica or the silicic acids. All the common clays are included under this umbrella.

**SEE OR SEARCH CLASS:**

516, Colloid Systems and Wetting Agents; Subcombinations Thereof; Processes

of Making, Stabilizing, Breaking, or Inhibiting, subclasses 31+ for colloid systems of colloid-sized solid or semi-solid phase dispersed in primarily organic continuous liquid phase, subclasses 38+ for colloid systems of colloid-sized bituminous, coal, or Carbon phase dispersed in aqueous continuous liquid phase, subclasses 77+ for colloid systems of colloid-sized solid phase dispersed in aqueous continuous liquid phase; subclasses 98+ for colloid systems of continuous or semicontinuous solid phase with discontinuous liquid phase (gels, pastes, flocs, coagulates); or agents for such systems or making or stabilizing such systems or agents; in each instance, when generically claimed or when there is no hierarchically superior provision in the USPC for the specifically claimed art.

**137 With non-siliceous boron compound as additional component or surface-treating agent:**

This subclass is indented under subclass 136. Compositions which contain, in addition to the silicon dioxide, silicic acid, metasilicate, or orthosilicate, a compound that contains boron but does not contain silicon; the compound may be present as an additional component or as a surface-treating agent for the silicon dioxide, silicic acid, orthosilicate, or metasilicate.

- (1) Note. Examples of components provided for herein are boron nitride, boric acid, and trialkyl borate.

**138 With non-siliceous fluorine-containing polymer as additional component or surface-treating agent (e.g., polytetrafluoroethylene, etc.):**

This subclass is indented under subclass 136. Compositions which contain, in addition to the silicon dioxide, silicic acid, orthosilicate, or metasilicate, a polymer that contains fluorine but does not contain silicon; the polymer may be present as an additional component or as a surface-treating agent for the silicon dioxide, silicic acid, orthosilicate, or metasilicate.

- (1) Note. An example of a component provided for herein is polytetrafluoroethylene.

**139 With elemental sulfur, elemental metal, or alloy as additional component or surface-treating agent:**

This subclass is indented under subclass 136. Compositions which contain, in addition to the silicon dioxide, silicic acid, orthosilicate or metasilicate, an alloy, elemental metal, or elemental sulfur; the elemental sulfur, alloy, or elemental metal may be present as an additional component or as a surface-treating agent for the silicon dioxide, silicic acid, orthosilicate, or metasilicate.

**140 Asbestos:**

This subclass is indented under subclass 136. Compositions which contain asbestos, which may or may not be surface-treated.

**141 With non-siliceous inorganic heavy metal or aluminum compound as additional component or surface-treating agent (e.g., molybdenum disulfide, alumina, etc.):**

This subclass is indented under subclass 136. Compositions which contain, in addition to the silicon dioxide, silicic acid, orthosilicate, or metasilicate, a compound which contains heavy metal or aluminum but does not contain silicon; the compound may be present as an additional component or as a surface-treating agent for the silicon dioxide, silicic acid, orthosilicate, or metasilicate.

- (1) Note. Examples of components provided for herein are molybdenum sulfide and aluminum sulfate.
- (2) Note. Arsenic is considered a heavy metal.
- (3) Note. Heavy metals are those with a specific gravity greater than 4.0.

**142 With carbohydrate or fibrous plant matter as additional component or surface-treating agent (e.g., starch, elm bark, cellulose compounds, etc.):**

This subclass is indented under subclass 136. Compositions which contain, in addition to the silicon dioxide, silicic acid, orthosilicate, or

metasilicate, a carbohydrate or fibrous plant matter; the fibrous plant matter or carbohydrate may be present as an additional component or as a surface-treating agent for the silicon dioxide, silicic acid, orthosilicate, or metasilicate.

- (1) Note. Examples of components provided for herein are dextrine and elm bark.

**143 With added water:**

This subclass is indented under subclass 136. Compositions which contain, in addition to the silicon dioxide, silicic acid, orthosilicate, or metasilicate, water that has been intentionally added.

**144 With carboxylic acid, salt thereof, sulfonic acid, or salt thereof as additional component or surface-treating agent:**

This subclass is indented under subclass 136. Compositions which contain, in addition to the silicon dioxide, silicic acid, orthosilicate, or metasilicate, a carboxylic acid, a carboxylic acid salt, a sulfonic acid, or a sulfonic acid salt; the carboxylic acid, sulfonic acid, or salts may be present as an additional component or as a surface-treating agent for the silicon dioxide, silicic acid, orthosilicate, or metasilicate.

**145 With triazine or triazole hetero ring compound as additional component or surface-treating agent:**

This subclass is indented under subclass 136. Compositions which contain, in addition to the silicon dioxide, silicic acid, orthosilicate or metasilicate, a compound that contains a triazine hetero ring or a triazole hetero ring; the compound may be present as an additional component or as a surface-treating agent for the silicon dioxide, silicic acid, orthosilicate, or metasilicate.

- (1) Note. A triazine hetero ring consists of three ring carbons and three ring nitrogens. A triazole hetero ring consists of two ring carbons and three ring nitrogens.

**146 With heterocyclic ring compound that has ring sulfur or has chalcogen double bonded to heterocyclic ring carbon as additional component or surface-treating agent; a heterocyclic ring is one having as ring members only carbon and at least one hetero atom**

**selected from chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) and nitrogen (e.g., thiadiazoles, cyclic carbonates, etc.):**

This subclass is indented under subclass 136. Compositions which contain, in addition to the silicon dioxide, silicic acid, orthosilicate, or metasilicate, a compound which has a heterocyclic ring having ring sulfur or having chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) double bonded to hetero ring carbon; the compound may be present as an additional component or as a surface-treating agent for the silicon dioxide, silicic acid, orthosilicate, or metasilicate.

**147 With azo compound, inorganic phosphorus salt, or oxidate of undetermined composition as additional component or surface-treating agent:**

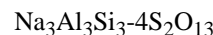
This subclass is indented under subclass 136. Compositions which contain, in addition to the silicon dioxide, silicic acid, orthosilicate, or metasilicate, an azo compound, an inorganic compound that is a phosphorus salt, or an oxidate of indeterminate composition; the azo compound, inorganic compound, or oxidate may be present as an additional component or as a surface-treating agent for the silicon dioxide, silicic acid, orthosilicate, or metasilicate.

- (1) Note. An azo compound is an organic compound characterized by the group -N=N- wherein both nitrogens are acyclic and each is bonded directly to carbon.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.

**148 Talc, mica, or ultramarine blue:**

This subclass is indented under subclass 136. Compositions which contain talc, mica, or ultramarine blue, any of which may or may not be surface-treated.

- (1) Note. Talc is  $3\text{MgO} \cdot 4\text{SiO}_2 \cdot \text{H}_2\text{O}$ . It is also called soapstone, French chalk, steatite, etc.
- (2) Note. Ultramarine blue is of the approximate formula



**149 Elemental halogen or elemental phosphorus:**

This subclass is indented under subclass 110. Compositions which contain elemental phosphorus or elemental halogen.

**150 Elemental metal or boron, or alloyed metal:**

This subclass is indented under subclass 110. Compositions which contain a metal alloy or elemental metal, or elemental boron.

**151 With nitrogen, sulfur, or halogen compound:**

This subclass is indented under subclass 150. Compositions which contain, in addition to the metal alloy or elemental metal, a compound that contains nitrogen, sulfur, or halogen.

**152 Elemental sulfur, selenium, or tellurium:**

This subclass is indented under subclass 110. Compositions which contain elemental sulfur, elemental selenium, or elemental tellurium.

- (1) Note. The elemental sulfur must be elemental sulfur that is added to the composition. Mineral oils, etc. that naturally contain a small amount of elemental sulfur do not meet the requirement of this subclass.

**153 With compound containing nitrogen, sulfur, phosphorus, boron, or halogen:**

This subclass is indented under subclass 152. Compositions which contain, in addition to the elemental sulfur, elemental selenium, or elemental tellurium, a compound that contains nitrogen, sulfur, phosphorus, boron, or halogen.

**154 Inorganic compound (except water) (Overbased or carbonated organic acidic compounds are not classified in this subclass or its indents on the basis of inorganic overbasing or carbonating agents; the overbased or carbonated compounds are treated as complexes, and are classified with the particular organic acidic compound):**

This subclass is indented under subclass 110. Compositions which contain an inorganic compound that is not (1) water or (2) an inorganic overbasing agent or inorganic carbonating agent used to overbase or carbonate an acidic organic compound.

- (1) Note. The compositions provided for by this subclass may contain water or an inorganic overbasing or carbonating agent, provided that there is also present an inorganic compound that is not water or an inorganic overbasing or carbonating agent.

- (2) Note. An inorganic compound is any chemical compound that is not within the definition of organic compound in Notes to the Class Definition.

- (3) Note. Overbased or carbonated organic acidic compounds are treated as complexes, and are classified with the particular acidic organic compound.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 186, for borated or boronated carbonated or overbased organic acid salts.  
391+, for overbased or carbonated sulfonates.  
460, for overbased or carbonated carboxylates.  
574, for overbased or carbonated phenol sulfides.

**155 The inorganic compound contains boron (e.g., boron nitride, boramine, etc.):**

This subclass is indented under subclass 154. Compositions wherein boron is in the inorganic compound.

- (1) Note. Examples of components provided for herein are boramide, boron trifluoride, and titanium diboride.

**156 Oxygen bonded directly to the boron (e.g., metal borates, boric oxide, etc.):**

This subclass is indented under subclass 155. Compositions wherein the boron is bonded directly to oxygen.

- (1) Note. Examples of components provided for herein are boric acid and potassium borate.

**157 With triglyceride or naturally occurring ester wax (e.g., beeswax, palm oil, tallow, etc.):**

This subclass is indented under subclass 156. Compositions which contain, in addition to the inorganic boron compound, a naturally occurring ester wax or a triglyceride.

- (1) Note. To be classified herein as a naturally occurring carboxylic acid ester wax, a substance must either be characterized as a naturally occurring carboxylic acid ester wax or be known to be a naturally occurring carboxylic acid ester wax.
- (2) Note. Examples of known naturally occurring carboxylic acid ester waxes are lanolin, beeswax, carnauba oil, and spermaceti.
- (3) Note. Triglycerides are compounds wherein glycerine has been esterified with three molar proportions of the same or different carboxylic acid, carboxylic acid halide, etc.

**158 With carboxylic acid or salt thereof:**

This subclass is indented under subclass 156. Compositions which contain, in addition to the inorganic boron compound, a salt of a carboxylic acid or a carboxylic acid, per se.

**159 With phosphorus compound:**

This subclass is indented under subclass 156. Compositions which contain, in addition to the inorganic boron compound, a compound that contains phosphorus.

**160 With acyclic organic compound consisting of carbon, hydrogen, and oxygen (e.g., glycols, glycol ethers, alcohols, etc.):**

This subclass is indented under subclass 156. Compositions which contain, in addition to the inorganic boron compound, an acyclic organic compound that consists of carbon, hydrogen, and oxygen.

- (1) Note. See Notes to the Class Definition for the definition of an organic compound.

- (2) Note. Examples of components provided for herein are aldehydes, ketones, ethers, and alcohols.

**161 The inorganic compound contains phosphorus or silicon (e.g., phosphorus sulfide, etc.):**

This subclass is indented under subclass 154. Compositions wherein silicon or phosphorus is in the inorganic compound.

- (1) Note. Examples of components provided for herein are  $\text{SiH}_2\text{Cl}_2$  and  $\text{PCl}_3$ .

**162 Oxygen bonded directly to the phosphorus (e.g., orthophosphoric acid, phosphate salts, etc.):**

This subclass is indented under subclass 161. Compositions wherein the phosphorus is bonded directly to oxygen.

- (1) Note. Examples of components provided for herein are phosphoric acid and ammonium polyphosphate.

**163 With inorganic compound not containing phosphorus (except water):**

This subclass is indented under subclass 162. Compositions which contain, in addition to the inorganic phosphorus compound, an inorganic compound that does not contain phosphorus and is not water.

**164 With carboxylic acid or salt thereof:**

This subclass is indented under subclass 162. Compositions which contain, in addition to the inorganic phosphorus compound, a salt of a carboxylic acid or a carboxylic acid, per se.

**165 The inorganic compound contains heavy metal or aluminum:**

This subclass is indented under subclass 154. Compositions wherein heavy metal or aluminum is in the inorganic compound.

- (1) Note. Arsenic is considered a heavy metal.
- (2) Note. Heavy metals are those with a specific gravity greater than 4.0.
- (3) Note. Examples of components provided for herein are tungsten carbonyl and titanium dioxide.

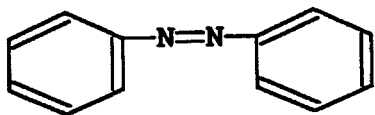
- 166 Sulfide, selenide, or telluride of heavy metal or aluminum (e.g., lithopone, etc.):**  
This subclass is indented under subclass 165. Compositions wherein the heavy metal or aluminum is present as a sulfide, a selenide or a telluride.
- 167 The heavy metal is molybdenum or tungsten (e.g., molybdenum sulfide, etc.):**  
This subclass is indented under subclass 166. Compositions which contain a sulfide, a selenide, or a telluride of molybdenum or tungsten.
- 168 With organic nitrogen or halogen compound:**  
This subclass is indented under subclass 167. Compositions which contain, in addition to the inorganic molybdenum or tungsten compound, an organic nitrogen compound or an organic halogen compound.
- (1) Note. An organic nitrogen compound is one wherein nitrogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound. Organic halogen compound is similarly defined.
  - (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 169 With sulfur compound or additional inorganic metal compound:**  
This subclass is indented under subclass 167. Compositions which contain, in addition to the inorganic molybdenum or tungsten compound, an additional inorganic compound containing metal or a sulfur compound.
- 170 Ammonium or additional diverse metal in the inorganic compound (e.g., alum, sodium molybdate, etc.):**  
This subclass is indented under subclass 165. Compositions wherein the inorganic compound contains, in addition to heavy metal or aluminum, an additional diverse metal or ammonium.
- (1) Note. Examples of components provided for herein are  $\text{KMnO}_4$  and ammonium uranate.
- 171 The heavy metal is iron or lead:**  
This subclass is indented under subclass 165. Compositions wherein iron or lead is the heavy metal.
- 172 Aluminum or zinc in the inorganic compound:**  
This subclass is indented under subclass 165. Compositions wherein zinc or aluminum is present in the inorganic compound.
- 173 With organic compound containing silicon:**  
This subclass is indented under subclass 154. Compositions which contain, in addition to the inorganic compound, an organic compound that contains silicon.
- (1) Note. See Notes to the Class Definition for the definition of an organic compound.
  - (2) Note. There are no restrictions on the type of bonding between silicon and the remainder of the compound.
- 174 With organic phosphorus compound:**  
This subclass is indented under subclass 154. Compositions which contain, in addition to the inorganic compound, an organic phosphorus compound.
- (1) Note. An organic phosphorus compound is one wherein phosphorus is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
  - (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 175 With organic  $-\text{C}(=\text{O})\text{O}-$  compound (e.g., ester waxes, etc.):**  
This subclass is indented under subclass 154. Compositions which contain, in addition to the inorganic compound, an organic  $-\text{C}(=\text{O})\text{O}-$  compound.
- (1) Note. An organic  $-\text{C}(=\text{O})\text{O}-$  compound is one wherein the carbon of the  $-\text{C}(=\text{O})\text{O}-$  group is, or is attached directly or indirectly by nonionic bonding to, the carbon of an organic compound.

- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 176 The inorganic compound contains nitrogen:**  
This subclass is indented under subclass 175. Compositions wherein nitrogen is in the inorganic compound.
- (1) Note. Examples of components provided for herein are sodium nitrite and ammonium carbonate.
- 177 With organic nitrogen compound:**  
This subclass is indented under subclass 175. Compositions which contain, in addition to the inorganic compound and the organic  $\text{-C(=O)O-}$  compound, an organic nitrogen compound.
- (1) Note. An organic nitrogen compound is one wherein nitrogen is attached directly or indirectly to carbon of an organic compound by nonionic bonding.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 178 The inorganic compound is a metal hydroxide or metal oxide:**  
This subclass is indented under subclass 175. Compositions wherein the inorganic compound is present as a metal hydroxide or as a metal oxide.
- (1) Note. To be provided for herein, the hydroxide or oxide must be present by intention, rather than merely in a trace amount remaining from, e.g., a saponification reaction.
- 179 With organic nitrogen or sulfur compound:**  
This subclass is indented under subclass 154. Compositions which contain, in addition to the inorganic compound, an organic nitrogen or an organic sulfur compound.
- (1) Note. An organic nitrogen compound is one wherein nitrogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound. Organic sulfur compound is similarly defined.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 180 The inorganic compound is a carbonate:**  
This subclass is indented under subclass 154. Compositions wherein the inorganic compound is a carbonate.
- 181 PTFE (polytetrafluoroethylene):**  
This subclass is indented under subclass 110. Compositions which contain an addition homopolymer of tetrafluoroethylene,  $\text{CF}_2=\text{CF}_2$ .
- (1) Note. The addition polymers provided for herein have the general formula  $(\text{-CF}_2\text{-CF}_2\text{-})_n$ .
- 182 With compound having ether group:**  
This subclass is indented under subclass 181. Compositions which contain, in addition to the polytetrafluoroethylene, a compound that contains an ether group.
- 183 With silicon compound, or organic phosphorus or sulfur compound:**  
This subclass is indented under subclass 181. Compositions which contain, in addition to the polytetrafluoroethylene, an organic phosphorus compound, an organic sulfur compound, or an organic compound that contains silicon.
- (1) Note. An organic phosphorus compound is one wherein phosphorus is attached directly or indirectly by nonionic bonding to carbon of an organic compound. Organic sulfur compound is similarly defined.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- (3) Note. The organic compound that contains silicon provided for herein can contain the silicon attached directly or indirectly to carbon of the organic compound by any type bonding.
- 184 Azo compound (i.e., compound having two acyclic nitrogens double bonded to each**

**other, and carbon single bonded to each of the nitrogens):**

This subclass is indented under subclass 110. Compositions which contain the acyclic group -N=N- wherein each nitrogen is single bonded directly to carbon.

- (1) Note. An example of a component provided for herein is



### 185 Organic compound containing boron:

This subclass is indented under subclass 110. Compositions which contain boron in an organic compound component.

- (1) Note. An example of a component provided for herein is:



- (2) Note. This subclass and its indents provide for organic compound components containing boron, regardless of the type bonding between boron and the rest of the compound.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 150+, for compositions containing elemental boron.  
155+, for compositions containing boron compounds that are inorganic.

### 186 Borated or boronated carbonated or overbased organic acid salts (e.g., borated overbased carbonated sulfonates, etc.):

This subclass is indented under subclass 185. Compositions wherein boron is present in the component as a borated or boronated carbonated or overbased salt of an organic acid.

- (1) Note. The organic acids most generally employed herein are sulfonic acids and phenols.  
(2) Note. An overbased compound herein is one which an amount of metal (e.g., Mg,

Ca, Ba, Sr) is present which is greater than the stoichiometric amount of metal which would be present if the organic acid were completely neutralized.

- (3) Note. A carbonated compound herein is the complex resulting from the reaction of carbon dioxide with a metal salt of an organic acid.  
(4) Note. The structure of the components provided for herein is generally not clear. The components are generally described in terms of their method of synthesis.

### 187 Phosphorus or silicon containing:

This subclass is indented under subclass 185. Compositions wherein the boron component also contains silicon or phosphorus.

- (1) Note. An example of a component provided for herein is:  $[(\text{CH}_3\text{O})_2\text{P}(\text{S})\text{S}-\text{CH}_2\text{CH}_2-\text{O}]_3\text{B}$   
(2) Note. The components provided for herein are not subject to any restrictions relative to the bonding between the boron and the phosphorus or silicon.

### 188 Nitrogen containing:

This subclass is indented under subclass 187. Compositions wherein the boron component contains (1) phosphorus and nitrogen or (2) silicon and nitrogen.

- (1) Note. The components provided for herein are not subject to any restrictions relative to the bonding among the boron, phosphorus, and nitrogen or the boron, silicon, and nitrogen.

### 189 Nitrogen containing (i.e., nitrogen and boron in the same compound):

This subclass is indented under subclass 185. Compositions wherein the boron component also contains nitrogen.

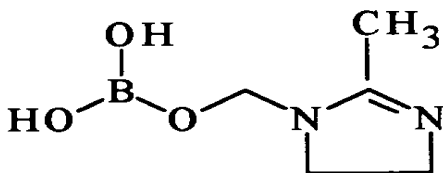
- (1) Note. The components provided for herein are not subject to any restrictions relative to the bonding between the boron and the nitrogen.

- (2) Note. An example of a component provided for herein is dibutylammonium tetrafluoroborate.

**190 The nitrogen is in a heterocyclic ring, which ring either appears in the compound or has been reacted with a boron compound; a heterocyclic ring is one having as ring members only carbon and at least one hetero atom selected from nitrogen and chalcogen (i.e., oxygen, sulfur, selenium, or tellurium):**

This subclass is indented under subclass 189. Compositions wherein the nitrogen is present as a member of a heterocyclic ring, which ring either remains intact in the component or has been reacted with a boron compound.

- (1) Note. An example of a component provided for herein is



**191 The nitrogen heterocyclic ring contains ring chalcogen (e.g., oxazoline compounds, etc.):**

This subclass is indented under subclass 190. Compositions wherein chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) is also a ring member in the nitrogen heterocyclic ring.

- (1) Note. An example of a component provided for herein is the borate salt of N-methyl morpholine.

**192 The nitrogen heterocyclic ring has chalcogen bonded directly to ring carbon adjacent to ring nitrogen (e.g., succinimide compounds, etc.):**

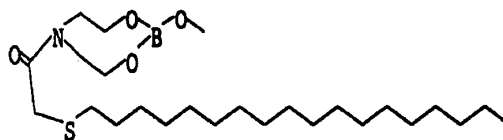
This subclass is indented under subclass 190. Compositions wherein chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) is bonded directly to ring carbon adjacent to ring nitrogen of the nitrogen heterocyclic ring.

- (1) Note. An example of a component provided for herein is the reaction product of a borated alkyl catechol and an alkyl succinimide.

**193 Sulfur containing:**

This subclass is indented under subclass 189. Compositions wherein the boron component contains nitrogen and sulfur.

- (1) Note. The components provided for herein are not subject to any restriction relative to the bonding among the boron, nitrogen, and sulfur.
- (2) Note. An example of a component provided for herein is



**194 Carbonyl containing:**

This subclass is indented under subclass 189. Compositions wherein the boron component contains nitrogen and carbonyl,  $-C(=O)-$ .

- (1) Note. The components provided for herein are not subject to any restriction relative to the bonding among the boron, nitrogen, and carbonyl.

**195 Oxygen and nitrogen bonded directly to the same carbon atom or carbon chain (e.g., borated alkanolamines, etc.):**

This subclass is indented under subclass 189. Compositions wherein, in the boron component, a carbon atom or carbon chain is bonded directly to both nitrogen and oxygen.

- (1) Note. An example of a component provided for herein is the reaction product of triethanolamine with orthoboric acid.

**196 With nitrogen heterocycle compound (e.g., thiadiazoles, etc.):**

This subclass is indented under subclass 195. Compositions which contain, in addition to the boron component, a nitrogen heterocycle compound.

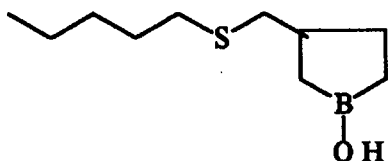
- (1) Note. A nitrogen heterocycle is a ring whose ring members are carbon and at least one hetero atom selected from

nitrogen and chalcogen (i.e., oxygen, sulfur, selenium, or tellurium). In this subclass, the heterocycle must contain ring nitrogen.

**197 Sulfur or halogen bonded indirectly to boron:**

This subclass is indented under subclass 185. Compositions wherein the boron is bonded indirectly to sulfur or to halogen.

- (1) Note. The components provided for herein are not subject to any restrictions relative to the bonding by which the boron is indirectly attached to sulfur or halogen.
- (2) Note. An example of a component provided for herein is



**198 Carbonyl containing:**

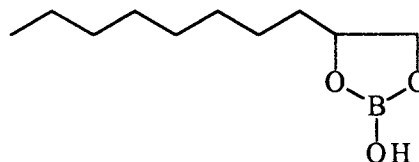
This subclass is indented under subclass 185. Compositions wherein the boron component also contains carbonyl,  $-C(=O)-$ .

- (1) Note. An example of a component provided for herein is the reaction product of calcium alkyl salicylate and orthoboric acid.

**199 Plural oxygens bonded directly to the same saturated carbon atom or saturated carbon chain (e.g., borated 1,2-glycols, borated alkoxyated alcohols, etc.):**

This subclass is indented under subclass 185. Compositions wherein, in the boron component, a saturated carbon atom or a saturated carbon chain is bonded directly to plural oxygens.

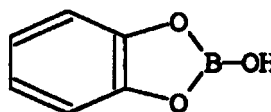
- (1) Note. An example of a component provided for herein is



**200 Benzene ring containing:**

This subclass is indented under subclass 185. Compositions wherein the boron component contains a benzene ring.

- (1) Note. An example of a component provided for herein is



**201 Compound of indeterminate structure, prepared by reacting a silicon compound of known structure:**

This subclass is indented under subclass 110. Compositions which contain a compound of indeterminate structure, prepared by the reaction of a silicon compound of known structure.

- (1) Note. Examples of components provided for herein are the reaction product of a poly (organo) silicone with an organic peroxide, and the reaction product of silicon disulfide with heptaldehyde.

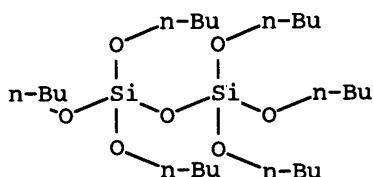
SEE OR SEARCH THIS CLASS, SUBCLASS:

161, for compositions containing silicon compounds which are inorganic.

**202 Organic compound containing silicon (e.g., silicon esters):**

This subclass is indented under subclass 110. Compositions which contain silicon in an organic compound component.

- (1) Note. An example of a component provided for herein is



- (2) Note. This subclass and its indents provide for organic compound components containing silicon, regardless of the type bonding between silicon and the remainder of the compound.

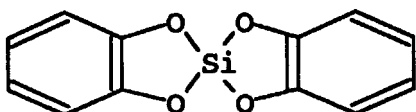
SEE OR SEARCH THIS CLASS, SUBCLASS:

161, for compositions containing silicon compounds that are inorganic.

**203 The silicon is in a ring:**

This subclass is indented under subclass 202. Compositions wherein a ring has silicon as one of its members.

- (1) Note. Examples of components provided for herein are cyclosiloxanes and



**204 Nitrogen attached directly or indirectly to the silicon by nonionic bonding:**

This subclass is indented under subclass 202. Compositions wherein the silicon is attached directly or indirectly to nitrogen by nonionic bonding.

- (1) Note. Examples of components provided for herein are  $(\text{CH}_3\text{O})_2\text{Si}(\text{NH}_2)_2$  and  $(\text{CH}_3)_2\text{NC}_6\text{H}_4\text{Si}(\text{CH}_3)_2\text{C}_6\text{H}_5$

**205 Phosphorus or -C(=X), wherein X is chalcogen, attached indirectly to the silicon by nonionic bonding:**

This subclass is indented under subclass 202. Compositions wherein the silicon is attached indirectly by nonionic bonding to phosphorus

or to  $-\text{C}(=\text{X})-$ , wherein X is chalcogen (i.e., oxygen, sulfur, selenium, or tellurium).

- (1) Note. Examples of components provided for herein are  $\text{CH}_3(\text{C}_4\text{H}_9)_2\text{SiCH}_2\text{P}(\text{C}_6\text{H}_5)_2$  and  $(\text{C}_6\text{H}_5)_3\text{Si}-\text{O}-\text{C}(=\text{O})-\text{CF}_2-\text{C}(=\text{O})\text{O}-\text{Si}(\text{C}_6\text{H}_5)_3$

**206 Halogen attached indirectly to the silicon by acyclic nonionic bonding:**

This subclass is indented under subclass 202. Compositions wherein the silicon is attached indirectly to halogen by acyclic nonionic bonding.

- (1) Note. An example of a component provided for herein is  $(\text{ClC}_3\text{H}_6\text{O})_4\text{Si}$ .

**207 Carbon or hydrogen bonded directly to the silicon:**

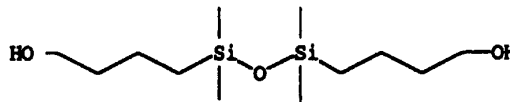
This subclass is indented under subclass 202. Compositions wherein the silicon is bonded directly to carbon or to hydrogen.

- (1) Note. Examples of components provided for herein are  $(\text{CH}_3)_2\text{SiH}_2$  and  $\text{CH}_3\text{Si}(\text{C}_6\text{H}_5)_3$ .

**208 Two silicons bonded directly to the same chalcogen (e.g., methylphenyl silicone, etc.):**

This subclass is indented under subclass 207. Compositions wherein a single chalcogen atom (i.e., oxygen, sulfur, selenium, or tellurium) is bonded directly to the silicon and to an additional silicon.

- (1) Note. An example of a component provided for herein is



**209 With organic nitrogen compound:**

This subclass is indented under subclass 208. Compositions which contain, in addition to the silicon compound, an organic nitrogen compound.

- (1) Note. An organic nitrogen compound is one wherein nitrogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 210 The nitrogen is in a hetero ring:**  
This subclass is indented under subclass 209. Compositions wherein the nitrogen is a ring member of a hetero ring.
- (1) Note. A hetero ring is one whose ring members are carbon and at least one hetero atom selected from nitrogen and chalcogen (i.e., oxygen, sulfur, selenium, or tellurium). In this subclass, the hetero ring must contain ring nitrogen.
- 211 Having -C(=X), wherein X is chalcogen, bonded directly to the nitrogen:**  
This subclass is indented under subclass 209. Compositions wherein the nitrogen is bonded directly to -C(=X)-, wherein X is chalcogen (i.e., oxygen, sulfur, selenium, or tellurium).
- 212 With organic -C(=O)O- compound (e.g., lithium 12-hydroxystearate, etc.):**  
This subclass is indented under subclass 208. Compositions which contain, in addition to the silicon compound, an organic -C(=O)O- compound.
- (1) Note. An organic -C(=O)O- compound is one wherein the carbon of the -C(=O)O- is, or is attached directly or indirectly by nonionic bonding to, the carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 213 Heavy metal or aluminum in the organic -C(=O)O- compound:**  
This subclass is indented under subclass 212. Compositions wherein the compound that contains the -C(=O)O- group also contains heavy metal or aluminum.
- (1) Note. Arsenic is considered a heavy metal.
- (2) Note. Heavy metals are considered to be those having a specific gravity greater than 4.0.
- 214 The single bonded oxygen is bonded directly to an additional carbon (e.g., carboxylic acid esters, etc.):**  
This subclass is indented under subclass 212. Compositions wherein an additional carbon is bonded directly to the single bonded oxygen of the -C(=O)O- group.
- (1) Note. The most common type of additional component provided for herein is a carboxylic acid ester.
- 215 With organic phosphorus, sulfur, or halogen compound:**  
This subclass is indented under subclass 208. Compositions which contain, in addition to the silicon compound, an organic phosphorus compound, an organic sulfur compound or an organic halogen compound.
- (1) Note. An organic phosphorus compound is one wherein phosphorus is attached directly or indirectly by nonionic bonding to carbon of an organic compound. Organic sulfur compound and organic halogen compound are similarly defined.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 216 Protein, carbohydrate, lignin, plant matter of indeterminate structure, or their reaction product of indeterminate structure:**  
This subclass is indented under subclass 110. Compositions which contain (1) carbohydrate, (2) protein, (3) lignin, (4) plant matter of indeterminate structure, or (5) a product of indeterminate structure prepared by reacting any of (1), (2), (3) or (4).
- (1) Note. Plant matter of indeterminate structure embraces both crude, unprocessed plant material and substances of indeterminate structure derived from processed or refined plant material.

## SEE OR SEARCH CLASS:

- 530, Chemistry: Natural Resins or Derivatives, subclass 350 definition and notes for the definition of a protein; subclass 500 for the definition of a lignin.
- 536, Organic Compound, class definition for the definition of a carbohydrate.

**217 Animal protein (e.g., fish scales, etc.):**

This subclass is indented under subclass 216. Compositions which contain animal protein.

- (1) Note. Included herein is animal protein in its raw and unprocessed forms (as in body parts or segments thereof), as well as in the form of partially or completely processed, refined, or isolated chemicals.

**218 Hair or leather:**

This subclass is indented under subclass 217. Compositions wherein the animal protein is identified as hair or leather.

**219 Cellulose ether or cellulose ester (e.g., cellulose nitrate, carboxymethylcellulose, etc.):**

This subclass is indented under subclass 216. Compositions which contain esterified or etherified cellulose.

**220 With carboxylic acid or salt thereof:**

This subclass is indented under subclass 216. Compositions which contain, in addition to the protein, carbohydrate, lignin, plant matter of indeterminate structure, or their reaction product of indeterminate structure, either a carboxylic acid or a salt of a carboxylic acid.

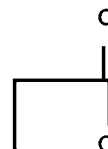
**221 Compound of indeterminate structure, prepared by reacting a heterocyclic compound of known structure; a heterocyclic ring is one having as ring members only carbon and at least one hetero atom selected from nitrogen and chalcogen (oxygen, sulfur, selenium, or tellurium):**

This subclass is indented under subclass 110. Compositions which contain a compound of indeterminate structure, prepared by the reaction of a compound of known structure having a heterocyclic ring whose members are carbon and at least one hetero atom selected from nitrogen and chalcogen (i.e., oxygen, sulfur, selenium, or tellurium).

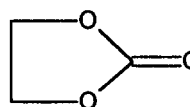
**222 The heterocyclic compound reactant contains a lactone or cyclic carbonate ring:**

This subclass is indented under subclass 221. Compositions wherein a lactone or a cyclic carbonate ring is present in the heterocyclic compound reactant.

- (1) Note. A lactone, for purposes of this subclass, is characterized by a hetero ring consisting of carbons and the  $-C(=O)O-$  group, e.g.,



- (2) Note. A cyclic carbonate, for purposes of this subclass, is characterized by a hetero ring consisting of carbons and the  $-O-C(=O)O-$  group, e.g.,

**223 The heterocyclic compound reactant contains a three- or four-membered hetero ring (e.g., aziridine, epoxy compounds, oxetane, etc.):**

This subclass is indented under subclass 221. Compositions wherein a three- or four-membered hetero ring is present in the heterocyclic compound reactant.

**224 An additional reactant contains phosphorus:**

This subclass is indented under subclass 223. Compositions wherein phosphorus is present in an additional reactant.

**225 An additional reactant contains nitrogen:**

This subclass is indented under subclass 223. Compositions wherein nitrogen is present in an additional reactant.

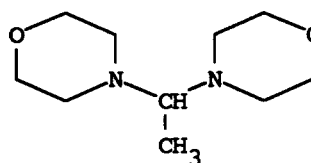
- 226 The heterocyclic compound reactant is sulfurized by means of an inorganic sulfurizing agent:**  
This subclass is indented under subclass 221. Compositions wherein an inorganic sulfurizing agent is reacted with the heterocyclic compound reactant.
- (1) Note. The most common inorganic sulfurizing agents are sulfur halide and elemental sulfur.
- 227 An additional reactant contains phosphorus**  
This subclass is indented under subclass 221. Compositions wherein phosphorus is present in an additional reactant.
- 228 The heterocyclic compound reactant has plural chalcogens bonded directly to ring carbons of the hetero ring (e.g., succinimides, anhydrides, etc.):**  
This subclass is indented under subclass 227. Compositions wherein plural chalcogens are bonded directly to ring carbons of the hetero ring of the heterocyclic compound reactant.
- (1) Note. The most common hetero ring reactants provided for herein are succinimide, succinic anhydride and maleic anhydride.
- 229 An additional reactant is an aldehyde or ketone:**  
This subclass is indented under subclass 221. Compositions wherein an aldehyde or ketone is an additional reactant.
- 230 An additional reactant is an inorganic compound containing heavy metal or aluminum (e.g., ammonium molybdate, etc.):**  
This subclass is indented under subclass 221. Compositions wherein an inorganic compound which contains heavy metal or aluminum is an additional reactant.
- (1) Note. An inorganic compound is any compound not specified as organic in Notes to the Class Definition.
- (2) Note. Arsenic is considered a heavy metal.
- (3) Note. Heavy metals are metals whose specific gravity is greater than 4.0.
- 231 The heterocyclic compound reactant contains a five-membered hetero ring with at least three ring hetero atoms (e.g., thiadiazole, benzotriazole, etc.):**  
This subclass is indented under subclass 221. Compositions wherein a five-membered hetero ring with at least three ring hetero atoms is present in the heterocyclic compound reactant.
- (1) Note. Examples of heterocyclic compound reactants provided for herein are triazoles, tetrazoles, oxadiazoles and thiadiazoles.
- 232 The heterocyclic compound reactant contains a carboxylic acid anhydride ring:**  
This subclass is indented under subclass 221. Compositions wherein a carboxylic acid anhydride ring is present in the heterocyclic compound reactant.
- (1) Note. A carboxylic acid anhydride ring, for purposes of this subclass, is characterized by the presence of a  $-C(=O)-O-C(=O)-$  group as part of the ring structure.
- (2) Note. Maleic anhydride and succinic anhydride are the two most common carboxylic acid anhydride reactants provided for herein.
- 233 An additional reactant is an alkadiene polymer:**  
This subclass is indented under subclass 232. Compositions wherein an alkadiene polymer is an additional reactant.
- (1) Note. Examples of polymer reactants provided for herein are homopolymers and copolymers of butadiene.
- 234 The alkadiene polymer is a terpolymer of ethylene, monoolefin, and alkadiene:**  
This subclass is indented under subclass 233. Compositions wherein a terpolymer of ethylene, monoolefin and alkadiene is the alkadiene polymer additional reactant.

- (1) Note. The monoolefin may be a cycloolefin.
- 235 An additional olefinic reactant is copolymerized with an unsaturated carboxylic acid anhydride so that the anhydride moiety forms part of the polymer backbone (i.e., addition polymerization):**  
This subclass is indented under subclass 232. Compositions wherein an unsaturated carboxylic acid anhydride is copolymerized by addition polymerization with an additional olefinic reactant so that the anhydride moiety forms part of the polymer backbone.
- (1) Note. Maleic anhydride is the most common unsaturated carboxylic acid anhydride reactant provided for herein.
- (2) Note. The additional olefinic reactant may be cycloolefinic.
- 236 An additional reactant is a sulfur compound:**  
This subclass is indented under subclass 232. Compositions wherein a compound that contains sulfur is an additional reactant.
- 237 With organic phosphorus compound:**  
This subclass is indented under subclass 232. Compositions which contain, in addition to the compound of indeterminate structure prepared by the reaction of the carboxylic acid anhydride reactant, an organic phosphorus compound.
- (1) Note. An organic phosphorus compound is one wherein phosphorus is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 238 An additional reactant is a polyoxyalkylene compound:**  
This subclass is indented under subclass 232. Compositions wherein a polyoxyalkylene compound is an additional reactant.
- 239 An additional reactant is a hydroxylamine or an alcoholic or phenolic hydroxy compound:**  
This subclass is indented under subclass 232. Compositions wherein an alcoholic hydroxy compound, phenolic hydroxy compound, or a hydroxylamine is an additional reactant.
- 240 Nitrogen attached directly or indirectly to the hydroxy group by nonionic bonding:**  
This subclass is indented under subclass 239. Compositions wherein the hydroxy group of the additional reactant is attached directly or indirectly to nitrogen by nonionic bonding.
- 241 An additional reactant is a copolymer having ethylene and acyclic olefin monomers (e.g., ethylene-alpha olefin copolymer or ethylene-butylene-styrene terpolymer grafted with maleic anhydride, etc.):**  
This subclass is indented under subclass 232. Compositions wherein a copolymer having acyclic olefin and ethylene monomers is an additional reactant.
- 242 An additional reactant is a phenol, a thiophenol, a carboxylic acid, or salt thereof:**  
This subclass is indented under subclass 221. Compositions wherein a phenol, a phenol salt, a thiophenol, a thiophenol salt, a carboxylic acid, or a carboxylic acid salt is an additional reactant.
- 243 Heterocyclic ring compound; a heterocyclic ring is one having as ring members only carbon and at least one hetero atom selected from nitrogen and chalcogen (i.e., oxygen, sulfur, selenium, or tellurium):**  
This subclass is indented under subclass 110. Compositions which contain a compound having a hetero ring whose members are carbon and at least one hetero atom selected from nitrogen and chalcogen (i.e. oxygen, sulfur, selenium, or tellurium).
- (1) Note. Examples of components provided for herein are heterocyclic compounds having more than six or fewer than five ring atoms in the hetero ring, and having only carbon and nitrogen as ring members.

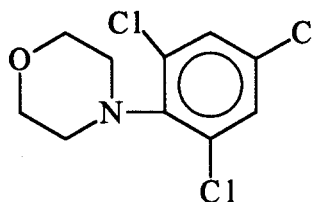
**244 The hetero ring contains six members including nitrogen and carbon (e.g., pyridine, picoline salts, etc.):**

This subclass is indented under subclass 243. Compositions wherein the hetero ring is six-membered with only carbon and nitrogen as ring members.

- (1) Note. Examples of components provided for herein are lauryl pyridinium chloride and picoline. Picoline is methyl pyridine.



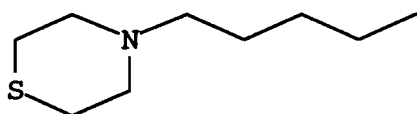
and



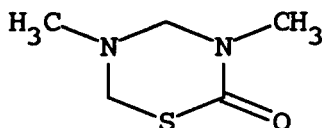
**245 Chalcogen in the hetero ring:**

This subclass is indented under subclass 244. Compositions wherein the hetero ring with carbon and nitrogen ring members also has chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) as a ring member.

- (1) Note. Examples of components provided for herein are



and



**246 The chalcogen is oxygen (e.g., oxazines, etc.):**

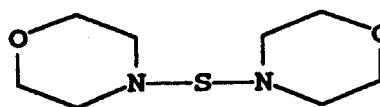
This subclass is indented under subclass 245. Compositions wherein the ring has nitrogen, carbon and oxygen as ring members.

- (1) Note. Examples of components provided for herein are

**247 Chalcogen attached directly to the hetero ring by nonionic bonding:**

This subclass is indented under subclass 246. Compositions wherein the hetero ring is attached directly to chalcogen (i.e. oxygen, sulfur, selenium, or tellurium) by nonionic bonding.

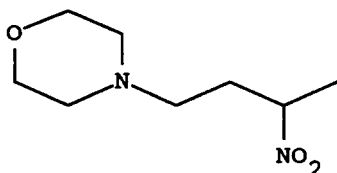
- (1) Note. Examples of components provided for herein are the copolymer of N-vinyl-3-morpholinone and butyl acrylate, and



**248 Acyclic nitrogen attached indirectly to the hetero ring by acyclic nonionic bonding:**

This subclass is indented under subclass 246. Compositions wherein nitrogen, which is not a ring member, is attached indirectly to the hetero ring by acyclic nonionic bonding.

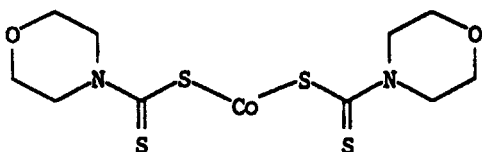
- (1) Note. An example of a component provided for herein is



**249 Acyclic chalcogen attached indirectly to the hetero ring by acyclic nonionic bonding:**

This subclass is indented under subclass 246. Compositions wherein chalcogen (i.e., oxygen, sulfur, selenium, or tellurium), which is not a ring member, is attached indirectly to the hetero ring by acyclic nonionic bonding.

- (1) Note. An example of a component provided for herein is cobalt bis (morpholinodithiocarbamate).



**250 Morpholine, per se, hydrocarbyl-substituted morpholine, or salts thereof:**

This subclass is indented under subclass 246. Compositions which contain morpholine, per se, salts thereof, hydrocarbyl substituted morpholine or salts thereof.

**251 Polycyclo ring system which contains the hetero ring as one of the cyclos (e.g., phenothiazines, etc.):**

This subclass is indented under subclass 245. Compositions wherein the hetero ring is one of the cyclos of a polycyclo ring system.

- (1) Note. Fused and bridged ring systems are considered to be polycyclo ring systems. Two rings joined solely by a spiro linkage are not considered to form a polycyclo ring system.
- (2) Note. An example of a component provided for herein is 3,7-dibornylphenothiazine.

**252 With compound having saturated or unsaturated triazine, azole, or pyridine ring:**

This subclass is indented under subclass 251. Compositions which contain, in addition to the polycyclo ring system having the hetero ring as one of the cyclos, a compound having a pyridine, triazine, or azole ring which may be saturated or unsaturated.

- (1) Note. The pyridine ring is six-membered consisting of five carbons and one nitrogen. The triazine ring is six-membered consisting of three carbons and three nitrogens. The azole ring is five-membered and has at least two ring hetero atoms, of which at least one must be nitrogen.

**253 With organic phosphorus compound:**

This subclass is indented under subclass 251. Compositions which contain, in addition to the polycyclo ring system having the hetero ring as one of the cyclos, an organic phosphorus compound.

- (1) Note. An organic phosphorus compound is one wherein phosphorus is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.

**254 With organic non-heterocyclic nitrogen compound:**

This subclass is indented under subclass 251. Compositions which contain, in addition to the polycyclo ring system having the hetero ring as one of the cyclos, an organic nitrogen compound which does not contain a heterocyclic ring.

- (1) Note. An organic nitrogen compound is one wherein nitrogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.

**255 Plural nitrogens in the hetero ring:**

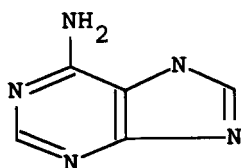
This subclass is indented under subclass 244. Compositions wherein the six-membered hetero ring has plural nitrogen ring members.

- (1) Note. An example of the type component provided for herein is monocyclic pyrimidine (1,3-diazine) compounds.

**256 Polycyclo ring system which contains the hetero ring as one of the cyclos:**

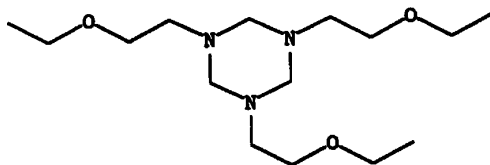
This subclass is indented under subclass 255. Compositions wherein the hetero ring is one of the cyclos of a polycyclo ring system.

- (1) Note. Fused and bridged ring systems are considered to be polycyclo ring systems. Two rings joined solely by a spiro linkage are not considered to form a polycyclo ring system.
- (2) Note. An example of a component provided for herein is

**257 Triazines:**

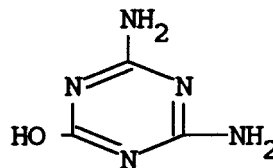
This subclass is indented under subclass 255. Compositions wherein the hetero ring consists of three carbons and three nitrogens.

- (1) Note. An example of a component provided for herein is

**258 Nitrogen bonded directly to the triazine ring by nonionic bonding:**

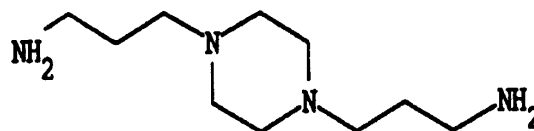
This subclass is indented under subclass 257. Compositions wherein the hetero ring is bonded directly to nitrogen by nonionic bonding.

- (1) Note. An example of a component provided for herein is

**259 1,4-Diazines:**

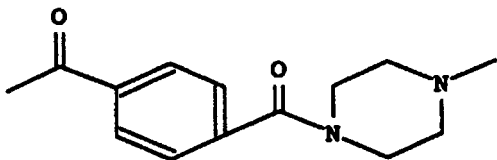
This subclass is indented under subclass 255. Compositions wherein the hetero ring consists of four carbons and two nitrogens, the nitrogens being in the 1- and 4-positions of the ring.

- (1) Note. An example of a component provided for herein is:

**260 Nitrogen and carbonyl attached indirectly to the 1,4-diazine ring by nonionic bonding:**

This subclass is indented under subclass 259. Compositions wherein the 1,4-diazine ring is attached indirectly to both nitrogen and carbonyl, -C(=O)-, by nonionic bonding.

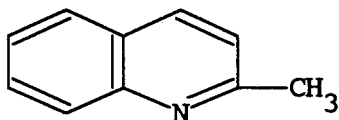
- (1) Note. An example of a component provided for herein is poly (terephthaloyl piperazine), the repeating unit of which is



**261 Polycyclo ring system which contains the hetero ring as one of the cyclos:**

This subclass is indented under subclass 244. Compositions wherein the hetero ring is one of the cyclos of a polycyclo ring system.

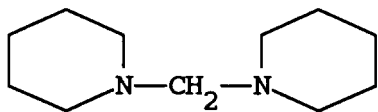
- (1) Note. Fused and bridged ring systems are considered to be polycyclo ring systems. Two rings joined solely by a spiro linkage are not considered to form a polycyclo ring system.
- (2) Note. An example of a component provided for herein is



**262 Piperidines:**

This subclass is indented under subclass 244. Compositions wherein the hetero ring is a completely saturated ring consisting of one nitrogen and five carbons.

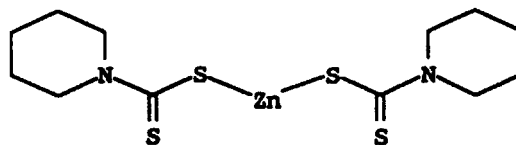
- (1) Note. An example of a component provided for herein is



**263 Having -C(=X)-, wherein X is chalcogen, bonded directly to the piperidine ring:**

This subclass is indented under subclass 262. Compositions wherein the hetero ring is bonded directly to -C(=X)-, wherein X is chalcogen (i.e., oxygen, sulfur, selenium, or tellurium).

- (1) Note. An example of a component provided for herein is zinc -N-pentamethylene dithiocarbamate.



**264 Vinyl pyridine polymer (e.g., polyvinylpyridine, vinyl-pyridine-alkyl acrylate copolymer, etc.):**

This subclass is indented under subclass 244. Compositions wherein the component containing the six-membered hetero ring results from homopolymerization or copolymerization of a vinyl pyridine.

- (1) Note. Homopolymerization or copolymerization normally occurs through the olefinic double bond.

**265 Non-pyridine organic nitrogen salt of the polymer, or a non-pyridine organic nitrogen compound is present:**

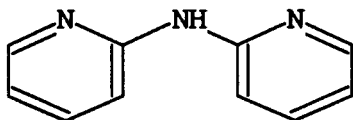
This subclass is indented under subclass 264. Compositions which (1) contain, in addition to the vinyl pyridine polymer, a non-pyridine organic nitrogen compound, or (2) contain the vinyl pyridine polymer in the form of its salt with a non-pyridine organic nitrogen compound.

- (1) Note. Examples of components provided for herein are (a) the N, N-dibutylcarbamate salt of lauryl methacrylate/2-methyl-5-vinyl pyridine copolymer, and (b) the combination of a vinyl pyridine/alkyl acrylate copolymer and an alkaline earth petroleum sulfonate-trialkylamine complex.
- (2) Note. An organic nitrogen compound is one wherein nitrogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (3) Note. See Notes to the Class Definition for the definition of organic compound.

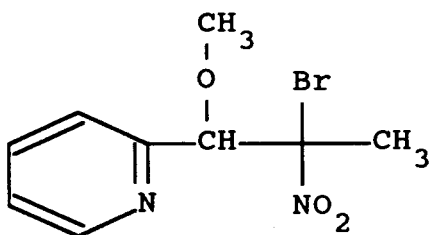
**266 Nitrogen attached to the hetero ring directly or indirectly by acyclic nonionic bonding:**

This subclass is indented under subclass 244. Compositions wherein the hetero ring is attached to nitrogen directly or indirectly by acyclic nonionic bonding.

- (1) Note. Examples of components provided for herein are

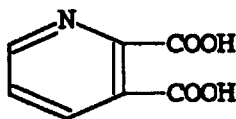


and

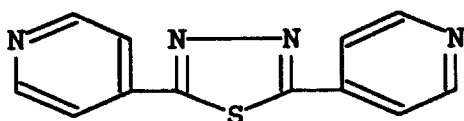
**267 Chalcogen or nitrogen attached indirectly to the hetero ring by nonionic bonding:**

This subclass is indented under subclass 244. Compositions wherein the hetero ring is attached indirectly to nitrogen or chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) by nonionic bonding.

- (1) Note. Examples of components provided for herein are:



and

**268 The hetero ring contains five members including nitrogen and carbon (e.g., polyvinylpyrrolidone, etc.):**

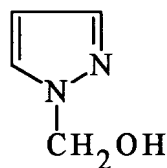
This subclass is indented under subclass 243. Compositions wherein the hetero ring is five-membered with carbon and nitrogen as ring members.

- (1) Note. An example of a component provided for herein is the copolymer of N-vinyl pyrrolidone and cetyl vinyl ether.

**269 Plural hetero atoms in the hetero ring (e.g., pyrazoles, benzimidazoles, etc.):**

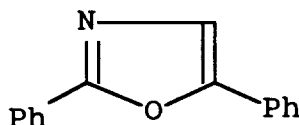
This subclass is indented under subclass 268. Compositions wherein no more than three ring members of the hetero ring are carbons.

- (1) Note. An example of a component provided for herein is

**270 Chalcogen in the hetero ring (e.g., benzoxazoles, etc.):**

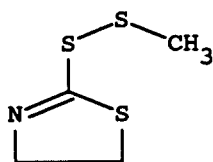
This subclass is indented under subclass 269. Compositions wherein the hetero ring with carbon and nitrogen ring members also has chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) as a ring member.

- (1) Note. An example of a component provided for herein is

**271 The chalcogen is sulfur (e.g., 1,3-thiazole, etc.):**

This subclass is indented under subclass 270. Compositions wherein the hetero ring has nitrogen, carbon, and sulfur as ring members.

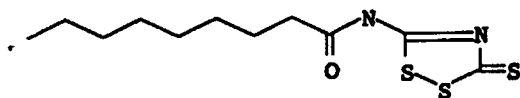
- (1) Note. An example of a component provided for herein is



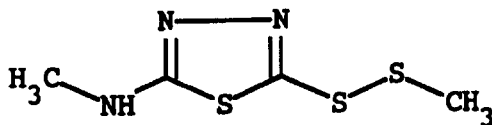
**272 Plural nitrogens or plural sulfurs in the hetero ring (e.g., thiadiazoles, etc.):**

This subclass is indented under subclass 271. Compositions wherein the hetero ring has more than one nitrogen ring member or more than one sulfur ring member.

- (1) Note. Examples of components provided for herein are



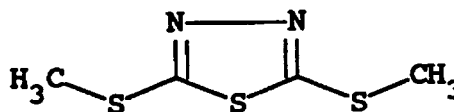
and



**273 Acyclic sulfur bonded directly to the 2- and 5- positions of a 1,3,4-thiadiazole ring or a hydrogenated 1,3,4-thiadiazole ring:**

This subclass is indented under subclass 272. Compositions wherein the 2- and 5-positions of a 1, 3, 4-thiadiazole ring or of a hydrogenated 1, 3, 4-thiadiazole ring are each bonded directly to acyclic sulfur.

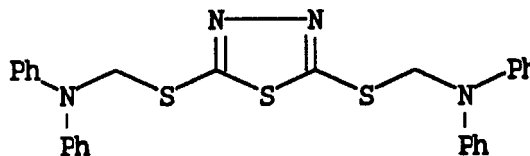
- (1) Note. An example of a component provided for herein is



**274 Oxygen or nitrogen attached indirectly to one of the acyclic sulfurs by acyclic nonionic bonding:**

This subclass is indented under subclass 273. Compositions wherein one of the acyclic sulfurs is attached indirectly to oxygen or nitrogen by acyclic nonionic bonding.

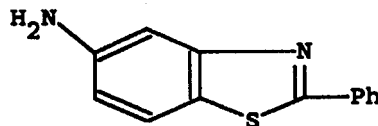
- (1) Note. An example of a component provided for herein is



**275 Polycyclo ring system which contains the hetero ring as one of the cyclos (e.g., benzothiazoles, etc.):**

This subclass is indented under subclass 271. Compositions wherein the hetero ring is one of the cyclos of a polycyclo ring system.

- (1) Note. Fused and bridged ring systems are considered to be polycyclo ring systems. Two rings joined solely by a spiro linkage are not considered to form a polycyclo ring system.
- (2) Note. An example of a component provided for herein is

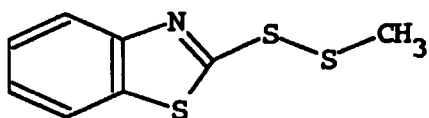


**276 The 2-position of the hetero ring is substituted by double bonded sulfur, a chain of sulfur atoms, or -SH (wherein H of -SH may**

**be substituted by metal, ammonium, or substituted ammonium):**

This subclass is indented under subclass 275. Compositions wherein double bonded sulfur, a chain of sulfur atoms, or -SH ( wherein H of -SH may be substituted by metal, ammonium, or substituted ammonium) is bonded directly to the 2-position of the hetero ring.

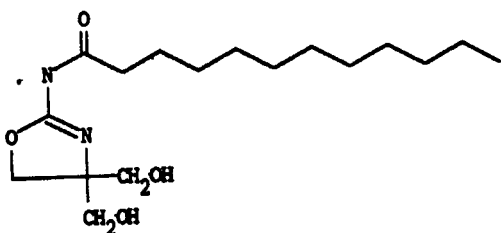
- (1) Note. An example of a component provided for herein is



- 277 Chalcogen or nitrogen bonded directly to ring carbon of the hetero ring (e.g., 2-oxazolidinones, etc.):**

This subclass is indented under subclass 270. Compositions wherein a ring carbon of the hetero ring is bonded directly to nitrogen or to chalcogen (i.e., oxygen, sulfur, selenium, or tellurium).

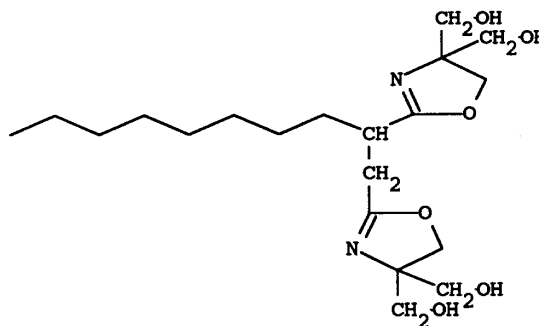
- (1) Note. An example of a component provided for herein is



- 278 Exactly one double bond in the hetero ring (e.g., bis-2-oxazolines, etc.):**

This subclass is indented under subclass 270. Compositions wherein the hetero ring has exactly one double bond between ring members.

- (1) Note. An example of a component provided for herein is



- 279 Three or four nitrogens in the hetero ring (e.g., 1,2,4-triazole, tetrazole, etc.):**

This subclass is indented under subclass 269. Compositions wherein the hetero ring has three nitrogen ring members or four nitrogen ring members.

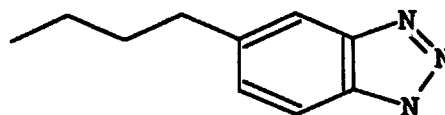
- (1) Note. The components provided for herein are monocyclic tetrazoles, monocyclic 1,2,3-triazoles, and monocyclic 1,2,4-triazoles.

- 280 Polycyclo ring system which contains the hetero ring as one of the cyclos (e.g., alkyl benzotriazoles, etc.):**

This subclass is indented under subclass 279. Compositions wherein the hetero ring is one of the cyclos of a polycyclo ring system.

- (1) Note. Fused and bridged ring systems are considered to be polycyclo ring systems. Two rings joined solely by a spiro linkage are not considered to form a polycyclo ring system.

- (2) Note. An example of a component provided for herein is

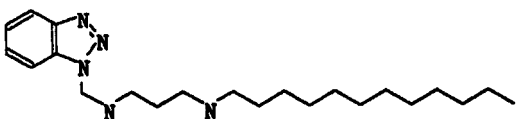


- 281 Chalcogen or nitrogen attached to the hetero ring directly or indirectly by acyclic non-**

**ionic bonding (e.g., methylene bis-benzotriazoles, etc.):**

This subclass is indented under subclass 280. Compositions wherein the hetero ring is attached directly or indirectly by acyclic non-ionic bonding to nitrogen or to chalcogen (i.e., oxygen, sulfur, selenium, or tellurium).

- (1) Note. An example of a component provided for herein is

**282 With organic phosphorus compound:**

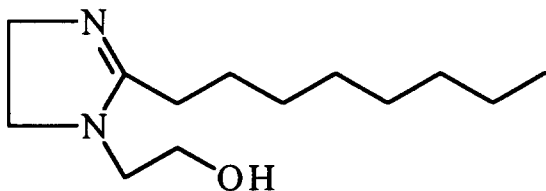
This subclass is indented under subclass 280. Compositions which contain, in addition to the hetero ring containing component, an organic phosphorus compound.

- (1) Note. An organic phosphorus compound is one wherein phosphorus is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.

**283 The hetero ring is a monocyclic 1,3-diazole or a monocyclic hydrogenated 1,3-diazole:**

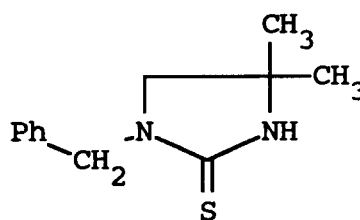
This subclass is indented under subclass 269. Compositions wherein the hetero ring is a saturated or unsaturated monocyclic 1,3-diazole ring.

- (1) Note. An example of a component provided for herein is

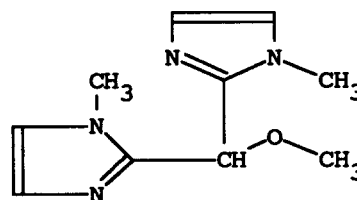
**284 Chalcogen or nitrogen bonded directly to ring carbon of the 1,3-hetero ring, or the****1,3-hetero ring has two double bonds between ring members:**

This subclass is indented under subclass 283. Compositions wherein the hetero ring has two double bonds between ring members, or ring carbon of the hetero ring is bonded directly to nitrogen or to chalcogen (i.e., oxygen, sulfur, selenium, or tellurium).

- (1) Note. Examples of components provided for herein are

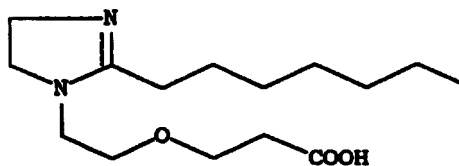


and

**285 Having -C(=X)-, wherein X is chalcogen, attached indirectly to the 1,3-hetero ring by nonionic bonding:**

This subclass is indented under subclass 283. Compositions wherein the hetero ring is attached indirectly by nonionic bonding to -C(=X)-, wherein X is chalcogen (i.e., oxygen, sulfur, selenium, or tellurium).

- (1) Note. An example of a component provided for herein is



**286 Organic phosphorus compound salt of the 1,3-hetero ring compound, or an organic phosphorus compound is present:**

This subclass is indented under subclass 283. Compositions which (1) contain, in addition to the hetero ring component, an organic phosphorus compound, or (2) wherein the hetero ring component is in the form of a salt with an organic phosphorus compound.

- (1) Note. An organic phosphorus compound is one wherein phosphorus is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of organic compound.

**287 Plural oxygens double bonded directly to ring carbons of the hetero ring which are adjacent to the ring nitrogen:**

This subclass is indented under subclass 268. Compositions wherein two carbons of the hetero ring, each adjacent to the ring nitrogen atom, are double bonded directly to oxygen.

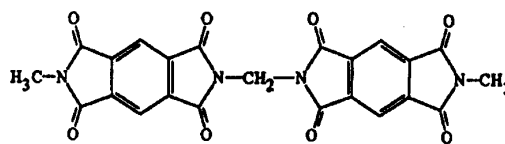
- (1) Note. An example of a component provided for herein is



**288 Polycyclo ring system which contains the hetero ring as one of the cyclos (i.e., fused or bridged ring system):**

This subclass is indented under subclass 287. Compositions wherein the hetero ring is one of the cyclos of a polycyclo ring system.

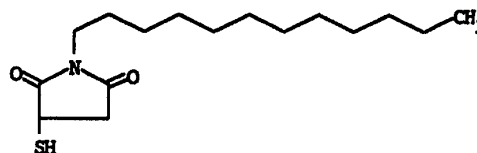
- (1) Note. Fused and bridged ring systems are considered to be polycyclo ring systems. Two rings joined solely by a spiro linkage are not considered to form a polycyclo ring system.
- (2) Note. An example of a component provided for herein is:



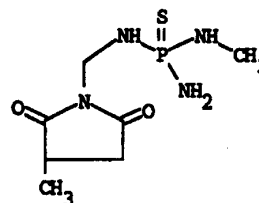
**289 Sulfur attached directly or indirectly to the hetero ring by nonionic bonding:**

This subclass is indented under subclass 287. Compositions wherein the hetero ring is attached to sulfur directly or indirectly by nonionic bonding.

- (1) Note. Examples of components provided for herein are



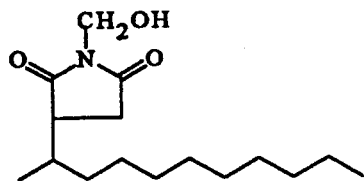
and



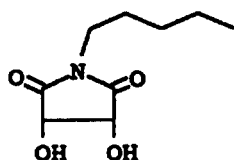
**290 Additional oxygen attached directly or indirectly to the hetero ring by nonionic bonding:**

This subclass is indented under subclass 287. Compositions wherein the hetero ring is attached to an additional oxygen directly or indirectly by nonionic bonding.

- (1) Note. Examples of components provided for herein are



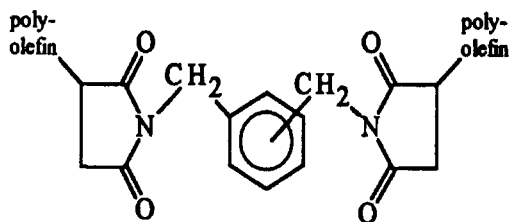
and



**291 Nitrogen attached indirectly to the hetero ring by nonionic bonding (e.g., bis-succinimide compounds, etc.):**

This subclass is indented under subclass 290. Compositions wherein the hetero ring is attached indirectly to nitrogen by nonionic bonding.

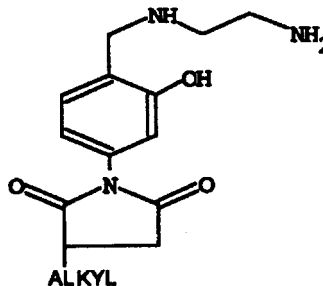
- (1) Note. An example of a component provided for herein is



**292 The oxygen is part of an ether linkage or is bonded directly to a benzene ring:**

This subclass is indented under subclass 291. Compositions wherein the oxygen is bonded directly to a benzene ring or is part of an ether linkage.

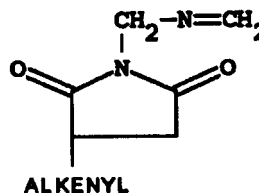
- (1) Note. An example of a component provided for herein is



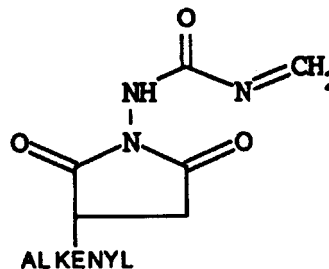
**293 Nitrogen attached directly or indirectly to the hetero ring by nonionic bonding:**

This subclass is indented under subclass 287. Compositions wherein the hetero ring is attached directly or indirectly by nonionic bonding to nitrogen.

- (1) Note. Examples of components provided for herein are



and

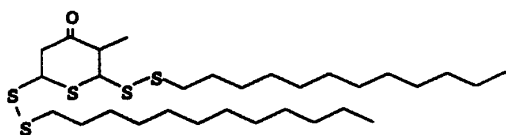


**294 With organic phosphorus compound:**

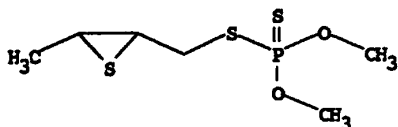
This subclass is indented under subclass 293. Compositions which contain, in addition to the hetero ring containing component, an organic phosphorus compound.

- (1) Note. An organic phosphorus compound is one wherein phosphorus is attached





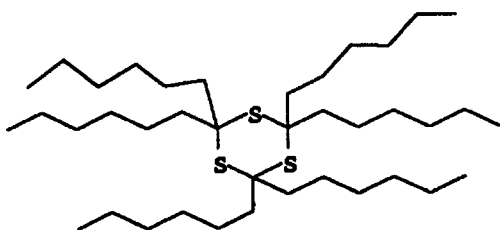
and



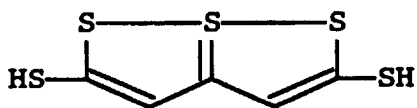
**300 Plural hetero atoms in the hetero ring (e.g., 1,3-dithiane, etc.):**

This subclass is indented under subclass 299. Compositions wherein the hetero ring has more than one ring hetero atom.

- (1) Note. Examples of components provided for herein are



and



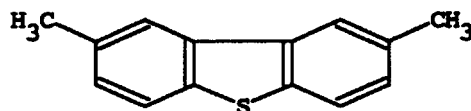
- (2) Note. This subclass also provides for components having a hetero ring with more than six members, ring sulfur and ring nitrogen, e.g., thiadiazepines, etc.

**301 Polycyclo ring system which contains the hetero ring as one of the cyclos (e.g., benzothiophenes, etc.):**

This subclass is indented under subclass 299. Compositions wherein the hetero ring is one of the cyclos of a polycyclo ring system.

- (1) Note. Fused and bridged ring systems are considered to be polycyclo ring systems. Two rings joined solely by a spiro linkage are not considered to form a polycyclo ring system.

- (2) Note. An example of a component provided for herein is



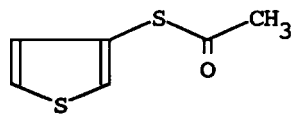
**302 The hetero ring is five-membered:**

This subclass is indented under subclass 299. Compositions wherein the hetero ring consists of one ring sulfur and four ring carbons.

**303 Chalcogen bonded directly to ring carbon of the hetero ring:**

This subclass is indented under subclass 302. Compositions wherein ring carbon of the hetero ring is bonded directly to chalcogen (i.e. oxygen, sulfur, selenium, or tellurium).

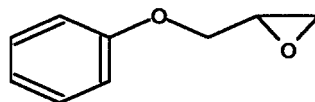
- (1) Note. An example of a component provided for herein is



**304 Oxygen containing hetero ring (e.g., allyl glycidyl ether, etc.):**

This subclass is indented under subclass 243. Compositions wherein oxygen and carbon are ring members of the hetero ring.

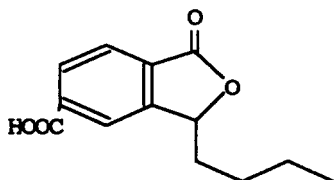
- (1) Note. An example of a component provided for herein is



**305 Chalcogen double bonded directly to a ring carbon of the hetero ring which is adjacent to a ring oxygen (e.g., lactones, etc.):**

This subclass is indented under subclass 304. Compositions wherein a ring carbon of the hetero ring, which carbon is adjacent to a ring oxygen, is double bonded directly to chalcogen (i.e. oxygen, sulfur, selenium, or tellurium).

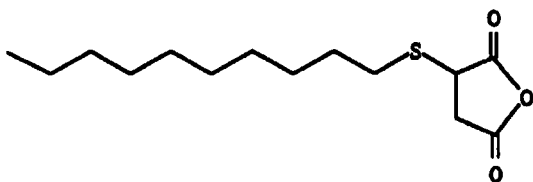
- (1) Note. An example of a component provided for herein is



**306 And chalcogen double bonded directly to the other ring carbon of the hetero ring which is adjacent to the ring oxygen (e.g., maleic anhydride copolymers, etc.):**

This subclass is indented under subclass 305. Compositions wherein both carbons of the hetero ring that are adjacent to the ring oxygen are double bonded directly to chalcogen (i.e., oxygen, sulfur, selenium, or tellurium).

- (1) Note. An example of a component provided for herein is



**307 The hetero ring contains at least five ring members (e.g., 1,3-dioxane, furan, etc.):**

This subclass is indented under subclass 304. Compositions wherein five or more ring members are present in the hetero ring.

- (1) Note. This subclass provides, inter alia, for components having a hetero ring with more than six members ring oxygen and ring nitrogen, e.g., oxazepines, etc.

**308 Having -C(=O)O- attached directly or indirectly to the hetero ring by nonionic bonding (e.g., sorbitan esters, etc.):**

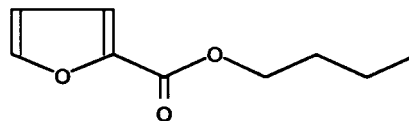
This subclass is indented under subclass 307. Compositions wherein the hetero ring is attached directly or indirectly to a -C(=O)O- group by nonionic bonding.

- (1) Note. Examples of components provided for herein are various carboxylic acid esters of sorbitans.

**309 The carbon of the -C(=O)O- group is bonded directly to the hetero ring (e.g., furoic acid, etc.):**

This subclass is indented under subclass 308. Compositions wherein the hetero ring is bonded directly to the carbon of the -C(=O)O- group.

- (1) Note. An example of a component provided for herein is



**310 With organic nitrogen compound:**

This subclass is indented under subclass 308. Compositions which contain, in addition to the hetero ring containing component, an organic nitrogen compound.

- (1) Note. An organic nitrogen compound is one wherein nitrogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.

**311 With sulfonic or carboxylic acid, or salt thereof:**

This subclass is indented under subclass 308. Compositions which contain, in addition to the hetero ring containing component, a carboxylic acid, carboxylic acid salt, sulfonic acid, or sulfonic acid salt.

**312 Organic oxidate of indeterminate composition:**

This subclass is indented under subclass 110. Compositions which contain a compound of indeterminate structure prepared by oxidation of an organic compound or of a mixture of organic compounds.

- (1) Note. The oxidates of this subclass and its indents are generally complex mixtures. An indication that the oxidate contains carboxylic acids is not sufficient to remove it from this subclass or its indents.
- (2) Note. See Notes to the Class Definition for the definition of organic compound.

**313 Substance oxidized contains nitrogen, chalcogen, halogen or phosphorus (e.g., oxidized sulfonate, phenol, ozonide, soap, etc.):**

This subclass is indented under subclass 312. Compositions wherein nitrogen, halogen, phosphorus, or chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) is present in the substance oxidized.

**314 The substance oxidized is a carboxylic acid ester (e.g., blown lard oil, sperm oil, rapeseed oil, etc.):**

This subclass is indented under subclass 313. Compositions wherein a carboxylic acid ester is the substance oxidized.

**315 Carboxylic acid ester subsequently formed from alcohol or acid of the organic oxidate:**

This subclass is indented under subclass 312. Compositions which contain a carboxylic acid ester subsequently formed from an alcohol or acid that is part of the organic oxidate of indeterminate composition.

- (1) Note. This subclass does not provide for carboxylic acid esters of known structure, per se; such are classified as components in subclass 459 and its indents.
- (2) Note. This subclass provides for components wherein an organic oxidate of indeterminate composition is made to undergo esterification (of either alcohol or carboxylic acid) to yield (1) a mixture, still of indeterminate composition, con-

taining a carboxylic acid ester, or (2) a carboxylic acid ester of indeterminate composition.

**316 With an organic nitrogen compound, which may or may not be reacted with the organic oxidate (e.g., reaction of oxidized olefinic copolymer with amine, formaldehyde, and phenol, etc.):**

This subclass is indented under subclass 312. Compositions (1) which contain, in addition to the organic oxidate of indeterminate composition, an organic nitrogen compound or (2) wherein the organic oxidate of indeterminate composition is reacted with an organic nitrogen compound.

- (1) Note. An organic nitrogen compound is one wherein nitrogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (2) Note. See the Notes to the Class Definition for the definition of organic compound.

**317 The organic oxidate is reacted with sulfur, a sulfur compound, halogen, phosphorus, or a phosphorus compound:**

This subclass is indented under subclass 312. Compositions wherein sulfur, a sulfur compound, halogen, phosphorus, or a phosphorus compound is reacted with the organic oxidate of indeterminate composition.

**318 With sulfonic acid or salt thereof:**

This subclass is indented under subclass 312. Compositions which contain, in addition to the organic oxidate of indeterminate composition, a sulfonic acid or salt thereof.

**319 With organic sulfur, phosphorus, or halogen compound:**

This subclass is indented under subclass 312. Compositions which contain, in addition to the organic oxidate of indeterminate structure, an organic sulfur compound, an organic phosphorus compound, or an organic halogen compound.

- (1) Note. An organic sulfur compound is one wherein sulfur is attached directly or indirectly by nonionic bonding to carbon of an organic compound. Organic phos-

- phorus compound and organic halogen compound are similarly defined.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 320 With a phenol, phenol salt, carboxylic acid, or carboxylic acid salt:**  
This subclass is indented under subclass 312. Compositions which contain, in addition to the organic oxidate of indeterminate structure, a carboxylic acid, a carboxylic acid salt, a phenol, or a phenol salt.
- 321 Salt of the organic oxidate:**  
This subclass is indented under subclass 312. Compositions wherein the organic oxidate of indeterminate composition has been salified, and exists in salt form.
- 322 Sulfurized compound of indeterminate structure, which is a reaction product of an organic compound with sulfur halide, elemental sulfur, or metal polysulfide:**  
This subclass is indented under subclass 110. Compositions which contain a compound of indeterminate structure which has been prepared by the reaction of an organic compound with elemental sulfur, with a sulfur halide, or with a metal polysulfide.
- (1) Note. See Notes to the Class Definition for the definition of organic compound.
- 323 Both sulfur and sulfur halide are reacted with the organic compound:**  
This subclass is indented under subclass 322. Compositions wherein the organic compound is reacted with elemental sulfur and with sulfur halide, either simultaneously or sequentially in either order.
- 324 Hydrogen sulfide or a salt thereof is also reacted with the organic compound:**  
This subclass is indented under subclass 322. Compositions wherein the organic compound is additionally reacted with hydrogen sulfide or with a salt thereof; said additional reaction can be prior to, simultaneous with or subsequent to sulfurization via elemental sulfur, sulfur halide, or metal polysulfide.
- 325 Phosphorus or an inorganic phosphorus compound is reacted with the organic compound either together with or subsequent to the sulfurizing agent (e.g., terpene-sulfur-phosphorus sulfide reaction products, reaction product of sulfurized olefin with phosphorus sulfide, etc.):**  
This subclass is indented under subclass 322. Compositions wherein the organic compound is also reacted with phosphorus or an inorganic phosphorus compound, either simultaneously with or subsequent to sulfurization via elemental sulfur, sulfur halide, or metal polysulfide.
- 326 The organic compound is an organic-C(=O)O- compound (e.g., sulfurized and phosphosulfurized sperm oil, fats, etc.):**  
This subclass is indented under subclass 325. Compositions wherein the organic compound sulfurized and reacted with phosphorus or an inorganic phosphorus compound is an organic -C(=O)O- compound.
- (1) Note. An organic -C(=O)O- compound is one in which the carbon of the -C(=O)O- group is, or is attached directly or indirectly by nonionic bonding to, the carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 327 With organic halogen compound:**  
This subclass is indented under subclass 326. Compositions which contain, in addition to the organic -C(=O)O- compound which is sulfurized and reacted with phosphorus, an inorganic phosphorus compound, or an organic halogen compound.
- (1) Note. An organic halogen compound is one wherein halogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.

- 328 The organic compound is an organic nitrogen compound (e.g., sulfurized nitriles, phosphatides, unsaturated amines, etc.):**  
This subclass is indented under subclass 322. Compositions wherein the organic compound that is sulfurized is an organic nitrogen compound.
- (1) Note. An organic nitrogen compound is one wherein the nitrogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
  - (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 329 The organic compound is an organic phosphorus or sulfur compound (e.g., sulfurized phosphate esters, sulfonates, etc.):**  
This subclass is indented under subclass 322. Compositions wherein the organic compound that is sulfurized is an organic phosphorus compound or an organic sulfur compound..
- (1) Note. An organic phosphorus compound is one wherein phosphorus is attached directly or indirectly by nonionic bonding to carbon of an organic compound. Organic sulfur compound is similarly defined.
  - (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 330 The organic compound is rosin, tall oil, or a derivative thereof of indeterminate structure:**  
This subclass is indented under subclass 322. Compositions wherein tall oil, rosin, or a derivative thereof of indeterminate structure is the organic compound sulfurized.
- (1) Note. If a derivative of rosin or of tall oil is known by its exact structure, such a sulfurized derivative is classified according to the known structure which is sulfurized.
- 331 The organic compound is a carboxylic acid or salt thereof:**  
This subclass is indented under subclass 322. Compositions wherein a carboxylic acid or a salt of a carboxylic acid is the organic compound sulfurized.
- 332 The organic compound is an organic oxygen compound which does not contain a -C(=O)O- group, or is an organic halogen compound (e.g., sulfurized pentadecylphenol, etc.):**  
This subclass is indented under subclass 322. Compositions wherein the organic compound sulfurized is an organic halogen compound, or is an organic oxygen compound that does not contain a -C(=O)O- group.
- (1) Note. An organic halogen compound is one wherein halogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound. Organic oxygen compound is similarly defined.
  - (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 333 The oxygen compound is an ether or has hydroxy bonded directly to acyclic or alicyclic carbon (e.g., sulfurized pine oil or cardanol ether, etc.):**  
This subclass is indented under subclass 332. Compositions wherein an ether or a compound having hydroxy bonded directly to acyclic or alicyclic carbon is the organic compound sulfurized.
- 334 With an organic nitrogen compound, which may or may not be reacted with the sulfurized compound:**  
This subclass is indented under subclass 322. Compositions (1) which contain, in addition to the sulfurized organic compound, an organic nitrogen compound or (2) wherein the sulfurized organic compound is reacted with an organic nitrogen compound.
- (1) Note. An organic nitrogen compound is one wherein nitrogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.

- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 335 The nitrogen is attached directly or indirectly to  $-C(=X)-$ , wherein X is chalcogen, by nonionic bonding (e.g., phosphatides, amides, zinc diamyl dithiocarbamate, etc.):**  
This subclass is indented under subclass 334. Compositions wherein  $-C(=X)-$ , wherein X is chalcogen (i.e., oxygen, sulfur, selenium, or tellurium), is attached directly or indirectly to the nitrogen by nonionic bonding.
- 336 With an organic  $-S(=O)(=O)O-$  compound, which may or may not be reacted with the sulfurized compound (e.g., sulfates, mahogany sulfonates, etc.):**  
This subclass is indented under subclass 322. Compositions (1) which contain, in addition to the sulfurized organic compound, an organic  $-S(=O)(=O)O-$  compound, or (2) wherein the sulfurized organic compound is reacted with an organic  $-S(=O)(=O)O-$  compound.
- (1) Note. An organic  $-S(=O)(=O)O-$  compound is one in which the  $-S(=O)(=O)O-$  group is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 337 With an organic phosphorus compound, which may or may not be reacted with the sulfurized compound:**  
This subclass is indented under subclass 322. Compositions (1) which contain, in addition to the sulfurized organic compound, an organic phosphorus compound, or (2) wherein the sulfurized organic compound is reacted with an organic phosphorus compound.
- (1) Note. An organic phosphorus compound is one wherein phosphorus is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 338 The organic phosphorus compound is a phosphorus acid, a salt thereof, or an indeterminate reaction product of hydrocarbon and phosphorus sulfide:**  
This subclass is indented under subclass 337. Compositions wherein the organic phosphorus compound is an indeterminate reaction product of hydrocarbon and phosphorus sulfide, or is a phosphorus acid, or a salt of a phosphorus acid.
- 339 With an organic  $-C(=O)O-$  compound, which may or may not be reacted with the sulfurized compound:**  
This subclass is indented under subclass 322. Compositions (1) which contain, in addition to the sulfurized organic compound, an organic  $-C(=O)O-$  compound, or (2) wherein the sulfurized organic compound is reacted with an organic  $-C(=O)O-$  compound.
- (1) Note. An organic  $-C(=O)O-$  compound is one in which the carbon of the  $-C(=O)O-$  group is, or is attached directly or indirectly by nonionic bonding to, the carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 340 The organic  $-C(=O)O-$  compound is naphthenic acid or a salt thereof:**  
This subclass is indented under subclass 339. Compositions wherein the organic  $-C(=O)O-$  compound is naphthenic acid, per se, or a salt of naphthenic acid.
- 341 With organic halogen compound:**  
This subclass is indented under subclass 322. Compositions (1) which contain, in addition to the sulfurized organic compound, an organic halogen compound, or (2) wherein the sulfurized organic compound is reacted with an organic halogen compound.
- (1) Note. An organic halogen compound is one wherein halogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.

**342 With an organic oxygen compound, which may or may not be reacted with the sulfurized compound:**

This subclass is indented under subclass 322. Compositions which (1) contain, in addition to the sulfurized organic compound, an organic oxygen compound, or (2) wherein the sulfurized organic compound is reacted with an organic oxygen compound.

- (1) Note. An organic oxygen compound is one in which oxygen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.

**343 Sulfurized mixture of hydrocarbon and carboxylic acid ester (i.e., products produced by sulfurizing a mixture containing both hydrocarbon and carboxylic acid ester):**

This subclass is indented under subclass 322. Compositions wherein the organic compound is a component of a mixture of a carboxylic acid ester and a hydrocarbon, which mixture is sulfurized, resulting in a mixture of sulfurized hydrocarbon and sulfurized carboxylic acid ester.

**344 Sulfurized carboxylic acid ester:**

This subclass is indented under subclass 322. Compositions wherein the organic compound sulfurized is a carboxylic acid ester.

**345 The carboxylic acid ester is a naturally occurring triglyceride or a naturally occurring wax ester (e.g., sulfurized lard oil, degreas, etc.):**

This subclass is indented under subclass 344. Compositions wherein the carboxylic acid ester is a naturally occurring wax ester or a naturally occurring triglyceride.

- (1) Note. Examples of naturally occurring ester waxes are lanolin, beeswax, degreas, carnauba wax, etc.
- (2) Note. Examples of naturally occurring triglycerides are corn oil, lard, soybean oil, palm oil, etc.

**346 Phosphosulfurized or phosphooxidized organic compound of indeterminate structure (i.e., indeterminate reaction products of organic compounds with phosphorus sulfides or oxides):**

This subclass is indented under subclass 110. Compositions which contain a compound of indeterminate structure which has been prepared by the reaction of an organic compound with a phosphorus sulfide or a phosphorus oxide.

- (1) Note. See Notes to the Class Definition for the definition of an organic compound.

**347 The organic compound is simultaneously reacted with an inorganic phosphorus halide:**

This subclass is indented under subclass 346. Compositions wherein an inorganic phosphorus halide and the phosphorus sulfide or oxide are simultaneously reacted with the organic compound.

**348 The organic compound is an organic nitrogen compound (e.g., phosphosulfurized nitriles, etc.):**

This subclass is indented under subclass 346. Compositions wherein the organic compound that is phosphosulfurized or phosphooxidized is an organic nitrogen compound.

- (1) Note. An organic nitrogen compound is one wherein nitrogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.

**349 The organic compound is a phosphorus ester or an organic -S(=O)(=O)O- compound (e.g., phosphosulfurized petroleum mahogany sulfonates, etc.):**

This subclass is indented under subclass 346. Compositions wherein the organic compound that is phosphosulfurized or phosphooxidized is a phosphorus ester or an organic -S(=O)(=O)O- compound.

- (1) Note. A phosphorus ester is characterized by divalent chalcogen bonded to both phosphorus and carbon, wherein the carbon may be single bonded to any atom but may be multiple bonded only to additional carbon.
  - (2) Note. An organic  $-S(=O)(=O)O-$  compound is one wherein the  $-S(=O)(=O)O-$  group is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
  - (3) Note. See Notes to the Class Definition for the definition of an organic compound.
- 350 Phosphosulfurized or phosphooxidized mixture of hydrocarbon and organic oxygen compound:**  
This subclass is indented under subclass 346. Compositions wherein the organic compound is a component of a mixture of hydrocarbon and an organic oxygen compound, which mixture is phosphosulfurized or phosphooxidized, resulting in a mixture of phosphosulfurized or phosphooxidized hydrocarbon and phosphosulfurized or phosphooxidized organic oxygen compound.
- (1) Note. An organic oxygen compound is one wherein oxygen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
  - (2) Note. See Notes to the Class Definition of the definition of an organic compound.
- 351 The organic compound is a carboxylic acid, salt, or ester (e.g., phosphosulfurized oleic acid, etc.)**  
This subclass is indented under subclass 346. Compositions wherein the organic compound that is phosphosulfurized or phosphooxidized is a carboxylic acid, a carboxylic acid salt, or a carboxylic acid ester.
- 352 The organic compound is a naturally occurring triglyceride or a naturally occurring**
- wax ester (e.g., phosphosulfurized degrass, etc.):**  
This subclass is indented under subclass 351. Compositions wherein the organic compound that is phosphosulfurized or phosphooxidized is a naturally occurring wax ester or naturally occurring triglyceride.
- (1) Note. Examples of naturally occurring wax esters are lanolin, beeswax, spermaceti, carnauba wax, etc.
  - (2) Note. Examples of naturally occurring triglycerides are corn oil, lard, soybean oil, palm oil, etc.
- 353 The organic compound contains -XH, wherein X is chalcogen, bonded directly to carbon and H of -XH may be replaced by metal (e.g., phosphosulfurized alkyl phenol sulfides, etc.):**  
This subclass is indented under subclass 346. Compositions wherein the organic compound that is phosphosulfurized or phosphooxidized contains carbon bonded directly to -XH, wherein H of -XH may be replaced by metal and X is chalcogen (i.e., oxygen, sulfur, selenium, or tellurium).
- (1) Note. Examples of components provided for herein are phosphosulfurized or phosphooxidized phenols, thiophenols, alcohols, and their salts, etc.
- 354 The organic compound is a hydrocarbon:**  
This subclass is indented under subclass 346. Compositions wherein the organic compound that is phosphosulfurized or phosphooxidized is a hydrocarbon.
- 355 With an organic nitrogen compound, which may or may not be reacted with the phosphosulfurized or phosphooxidized hydrocarbon:**  
This subclass is indented under subclass 354. Compositions (1) which contain, in addition to the phosphosulfurized or phosphooxidized hydrocarbon, an organic nitrogen compound or (2) wherein the phosphosulfurized or phosphooxidized hydrocarbon is reacted with an organic nitrogen compound.
- (1) Note. An organic nitrogen compound is one wherein nitrogen is attached directly

or indirectly by nonionic bonding to carbon of an organic compound.

- (2) Note. See Notes to the Class Definition for the definition of an organic compound.

**356 The nitrogen is attached directly or indirectly to  $-C(=X)-$ , wherein X is chalcogen, by nonionic bonding (e.g., amides, aminocarboxylic acids, etc.):**

This subclass is indented under subclass 355. Compositions wherein  $-C(=X)-$ , wherein X is chalcogen (i.e., oxygen, sulfur, selenium or tellurium), is attached directly or indirectly to the nitrogen of the organic nitrogen compound by nonionic bonding.

**357 With an organic phosphorus compound, which may or may not be reacted with the phosphosulfurized or phosphooxidized hydrocarbon:**

This subclass is indented under subclass 354. Compositions (1) which contain, in addition to the phosphosulfurized or phosphooxidized hydrocarbon, an organic phosphorus compound or (2) wherein the phosphosulfurized or phosphooxidized hydrocarbon is reacted with an organic phosphorus compound.

- (1) Note. An organic phosphorus compound is one wherein phosphorus is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of organic compound.

**358 With an organic  $-S(=O)(=O)O-$  compound, which may or may not be reacted with the phosphosulfurized or phosphooxidized hydrocarbon:**

This subclass is indented under subclass 354. Compositions (1) which contain, in addition to the phosphosulfurized or phosphooxidized hydrocarbon, an organic  $-S(=O)(=O)O-$  compound or (2) wherein the phosphosulfurized or phosphooxidized hydrocarbon is reacted with an organic  $-S(=O)(=O)O-$  compound.

- (1) Note. An organic  $-S(=O)(=O)O-$  compound is one wherein the  $-S(=O)(=O)O-$  group is attached directly or indirectly

by nonionic bonding to carbon of an organic compound.

- (2) Note. See Notes to the Class Definition for the definition of an organic compound.

**359 With an organic  $-C(=X)X-$  compound, wherein the X's may be same or diverse chalcogens, which compound may or may not be reacted with the phosphosulfurized or phosphooxidized hydrocarbon:**

This subclass is indented under subclass 354. Compositions (1) which contain, in addition to the phosphosulfurized or phosphooxidized hydrocarbon, an organic  $-C(=X)X-$  compound, wherein the X's may be the same or diverse chalcogens (i.e., oxygen, sulfur, selenium, or tellurium) or (2) wherein the phosphosulfurized or phosphooxidized hydrocarbon is reacted with such an organic  $-C(=X)X-$  compound.

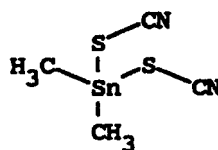
- (1) Note. An organic  $-C(=X)X-$  compound is one wherein the carbon of the  $-C(=X)X-$  group is, or is attached directly or indirectly by nonionic bonding to, the carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.

**360 With an organic chalcogen compound, which may or may not be reacted with the phosphosulfurized or phosphooxidized hydrocarbon (e.g., phenols, alcohols, quinones, etc.):**

This subclass is indented under subclass 354. Compositions (1) which contain, in addition to the phosphosulfurized or phosphooxidized hydrocarbon, an organic chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) compound or (2) wherein the phosphosulfurized or phosphooxidized hydrocarbon is reacted with an organic chalcogen compound.

- (1) Note. An organic chalcogen compound is one in which chalcogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.

- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 361 The phosphosulfurized or phosphooxidized hydrocarbon is reacted with water, a base, a metal compound, or elemental metal (e.g., overbased phosphosulfurized hydrocarbon, etc.):**  
This subclass is indented under subclass 354. Compositions wherein water, a base, a metal compound, or elemental metal is reacted with the phosphosulfurized or phosphooxidized hydrocarbon.
- 362 Nitrogen and heavy metal, or nitrogen and aluminum, in the same compound:**  
This subclass is indented under subclass 110. Compositions which contain a compound containing heavy metal and nitrogen, or a compound containing aluminum and nitrogen.
- (1) Note. Arsenic is considered a heavy metal.
- (2) Note. Heavy metals are considered to be those having a specific gravity greater than 4.0.
- (3) Note. Examples of components provided for herein are trioctylmethylammonium thiomolybdate and  $C_6H_5NHAsCl_2$ .
- 363 The nitrogen is bonded directly to the carbon of a  $-C(=X)X-$  group, wherein the X's may be the same or diverse chalcogens (e.g., dithiocarbamates, etc.):**  
This subclass is indented under subclass 362. Compositions wherein the carbon of a  $-C(=X)X-$  group, wherein the X's may be the same or diverse chalcogens (i.e., oxygen, sulfur, selenium, or tellurium) is bonded directly to the nitrogen.
- 364 With organic nitrogen, phosphorus, or chalcogen compound:**  
This subclass is indented under subclass 363. Compositions which contain, in addition to the nitrogen-heavy metal or nitrogen-aluminum compound, an organic phosphorus compound, an organic nitrogen compound, or an organic chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) compound.
- (1) Note. An organic phosphorus compound is one wherein phosphorus is attached directly or indirectly by nonionic bonding to carbon of an organic compound. Organic nitrogen compound and organic chalcogen compound are similarly defined.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 365 With metal compound:**  
This subclass is indented under subclass 364. Compositions which contain, further, an organic compound that contains metal.
- (1) Note. See Notes to the Class Definition for the definition of an organic compound.
- 366 The nitrogen is multiple bonded to carbon, or is bonded directly to additional nitrogen:**  
This subclass is indented under subclass 362. Compositions wherein carbon is multiple bonded to the nitrogen, or an additional nitrogen is bonded to the nitrogen.
- (1) Note. Examples of components provided for herein are: the iron salt of N-nitroso phenyl hydroxylamine, and



- 367 Containing  $-C(=X)-$ , wherein X is chalcogen:**  
This subclass is indented under subclass 362. Compositions wherein the compound that contains nitrogen and heavy metal or nitrogen and aluminum also contains  $-C(=X)-$ , wherein X is chalcogen (i.e., oxygen, sulfur, selenium, or tellurium).

- (1) Note. An example of a component provided for herein is  $[(C_8H_{17})_2N-CH_2CH_2COO]_2Pb$

**368 Heavy metal or aluminum in an organic phosphorus compound having four chalcogens bonded directly to the phosphorus:**

This subclass is indented under subclass 110. Compositions which contain an organic phosphorus compound which (1) contains heavy metal or aluminum and (2) has four chalcogens (i.e., oxygen, sulfur, selenium, or tellurium) bonded directly to the phosphorus.

- (1) Note. An organic phosphorus compound is one wherein phosphorus is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- (3) Note. An example of a component provided for herein is  $(\text{CH}_3\text{O})_2\text{P}(\text{S})\text{S}-\text{Ti}(\text{OCH}_3)_3$

**369 The phosphorus is bonded indirectly to an additional diverse metal or to carbonyl (e.g., molybdenum-zinc dialkyldithiophosphates, etc.):**

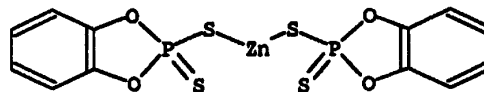
This subclass is indented under subclass 368. Compositions wherein carbonyl or an additional diverse metal is bonded indirectly to the phosphorus.

- (1) Note. There are no restrictions relative to the type of bonding between the phosphorus and the carbonyl or additional metal.
- (2) Note. Examples of components provided for herein are  $[(\text{CH}_3\text{OC}(\text{O})\text{CH}_2\text{O})_2\text{P}(\text{S})\text{S}]_2\text{Zn}$  and  $\text{ZnMo}_2\text{O}_3[\text{S}(\text{S})\text{P}(\text{OAlkyl})_2]_6$

**370 The phosphorus is attached indirectly to chalcogen by nonionic bonding, or is part of a ring consisting of phosphorus, carbon, and chalcogen:**

This subclass is indented under subclass 368. Compositions wherein (1) the phosphorus is part of a ring consisting of phosphorus, carbon, and chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) or (2) chalcogen is attached indirectly to the phosphorus by nonionic bonding.

- (1) Note. Examples of components provided for herein are  $[(\text{C}_9\text{H}_{19}\text{C}_6\text{H}_4\text{OCH}_2\text{CH}_2\text{O})_2\text{P}(=\text{S})\text{S}]_2\text{Zn}$  and



**371 The heavy metal is zinc:**

This subclass is indented under subclass 368. Compositions wherein zinc is the heavy metal.

- (1) Note. An example of a component provided for herein is zinc dihexyl dithiophosphate.

**372 With organic sulfonate compound:**

This subclass is indented under subclass 371. Compositions which contain, in addition to the zincorganic phosphorus compound, an organic sulfonate compound.

- (1) Note. An organic sulfonate compound is one wherein an  $-\text{S}(=\text{O})(\text{O})\text{O}-$  group is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.

**373 With organic nitrogen compound:**

This subclass is indented under subclass 372. Compositions which contain, in addition to the zincorganic phosphorus compound and the organic sulfonate compound, an organic nitrogen compound.

- (1) Note. An organic nitrogen compound is one wherein nitrogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.

- 374 With organic -C(=X)X- compound, wherein the X's may be the same or diverse chalcogens:**  
This subclass is indented under subclass 372. Compositions which contain, in addition to the zincorganic phosphorus compound and the organic sulfonate compound, an organic -C(=X)X- compound, wherein the X's may be the same or diverse chalcogens (i.e., oxygen, sulfur, selenium, or tellurium).
- (1) Note. An organic -C(=X)X- compound is one wherein the carbon of the -C(=X)X- group is, or is attached directly or indirectly by nonionic bonding to, the carbon of an organic compound.
  - (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 375 With organic nitrogen compound:**  
This subclass is indented under subclass 371. Compositions which contain, in addition to the zincorganic phosphorus compound, an organic nitrogen compound.
- (1) Note. An organic nitrogen compound is one wherein nitrogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
  - (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 376 The nitrogen is bonded directly to -C(=X)-, wherein X is chalcogen (e.g., amides, etc.):**  
This subclass is indented under subclass 375. Compositions wherein -C(=X)-, wherein X is chalcogen (i.e., oxygen, sulfur, selenium, or tellurium), is bonded directly to the nitrogen.
- 377 With organic phosphorus compound that does not contain zinc:**  
This subclass is indented under subclass 371. Compositions which contain, in addition to the zincorganic phosphorus compound, an organic phosphorus compound that does not contain zinc.
- 378 With organic chalcogen compound that does not contain phosphorus:**  
This subclass is indented under subclass 371. Compositions which contain, in addition to the zincorganic phosphorus compound, an organic chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) compound that does not contain phosphorus.
- (1) Note. An organic chalcogen compound is one wherein chalcogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
  - (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 379 The heavy metal is molybdenum, a rare earth metal, gold, silver, or mercury:**  
This subclass is indented under subclass 368. Compositions wherein molybdenum, a rare earth metal, gold, silver, or mercury is the heavy metal.
- 380 With organic chalcogen compound that does not contain phosphorus:**  
This subclass is indented under subclass 368. Compositions which contain, in addition to the organic phosphorus compound, an organic chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) compound that does not contain phosphorus.
- (1) Note. An organic chalcogen compound is one wherein chalcogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
  - (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 381 Heavy metal or aluminum in the same compound with alkali or alkaline earth metal:**  
This subclass is indented under subclass 110. Compositions wherein an alkali metal or an alkaline earth metal is present in the same organic compound as a heavy metal or aluminum.

- (1) Note. An example of a component provided for herein is  $\text{Li}(\text{C}_{17}\text{H}_{35}\text{CO}_2)_2\text{Al}(\text{OH})_3$
- (2) Note. Arsenic is considered a heavy metal.
- (3) Note. Heavy metals are those whose specific gravity is greater than 4.0.
- 382 Heavy metal or aluminum bonded directly to carbon:**  
This subclass is indented under subclass 110. Compositions wherein carbon is bonded directly to heavy metal or to aluminum.
- (1) Note. Arsenic is considered a heavy metal.
- (2) Note. Heavy metals are those whose specific gravity is greater than 4.0.
- (3) Note. An example of a component provided for herein is  $(\text{CH}_3)_3\text{Sn-Sn}(\text{C}_6\text{H}_5)_3$
- 383 The heavy metal or aluminum is bonded directly to carbonyl, or is double bonded directly to chalcogen:**  
This subclass is indented under subclass 382. Compositions wherein carbonyl is bonded directly to the heavy metal or aluminum, or chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) is double bonded directly to the heavy metal or aluminum.
- (1) Note. Examples of components provided for herein are organo metal carbonyl compounds and  $(\text{CH}_3)_2\text{Sn}=\text{S}$ .
- 384 The heavy metal or aluminum is directly bonded only to carbon:**  
This subclass is indented under subclass 382. Compositions wherein only carbon is directly bonded to the heavy metal or aluminum.
- (1) Note. An example of a compound provided for herein is tetraphenyl tin.
- 385 Heavy metal or aluminum naphthenate, in combination with an organic nitrogen, sulfur, or phosphorus compound:**  
This subclass is indented under subclass 110. Compositions which contain an organic nitrogen compound, an organic sulfur compound, or an organic phosphorus compound, in combination with a heavy metal or aluminum salt of naphthenic acid.
- (1) Note. Arsenic is considered a heavy metal.
- (2) Note. Heavy metals are those whose specific gravity is greater than 4.0.
- (3) Note. An organic nitrogen compound is one wherein nitrogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound. Organic sulfur compound and organic phosphorus compound are similarly defined.
- (4) Note. See Notes to the Class Definition for the definition of an organic compound.
- 386 Organic -XCN or -N=C=X compound, wherein X is chalcogen:**  
This subclass is indented under subclass 110. Compositions wherein -XCN or -N=C=X, wherein X in each instance is chalcogen (i.e., oxygen, sulfur, selenium, or tellurium), is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (1) Note. See Notes to the Class Definition for the definition of an organic compound.
- (2) Note. Examples of components provided for herein are  $\text{C}_6\text{H}_5\text{-N}=\text{C}=\text{S}$  and  $\text{C}_6\text{H}_5\text{CH}_2\text{SCN}$ .
- 387 Compound of indeterminate structure, prepared by reacting an organic sulfonate compound of known structure:**  
This subclass is indented under subclass 110. Compositions which contain a compound of indeterminate structure, prepared by the reaction of a compound of known structure having carbon of an organic compound attached

directly or indirectly by nonionic bonding to a sulfonate,  $-S(=O)(=O)O-$ , group.

- (1) Note. Components of indeterminate structure prepared by the reaction of organic sulfate compounds of known structure are provided for herein, because the sulfate group,  $-O-S(=O)(=O)O-$ , contains  $-S(=O)(=O)O-$ .
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.

**388 Organic sulfur compound, wherein the sulfur is single bonded directly to oxygen (e.g., sulfites, etc.):**

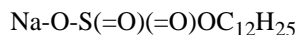
This subclass is indented under subclass 110. Compositions which contain a compound wherein sulfur is (1) single bonded directly to oxygen, and (2) is attached directly or indirectly by nonionic bonding to carbon of an organic compound.

- (1) Note. See Notes to the Class Definition for the definition of an organic compound.
- (2) Note. An example of a component provided for herein is p-ethyl benzene sulfonic acid,  $C_2H_5C_6H_4S(O)OH$ .

**389 The sulfur is part of an  $-O-S(=O)(=O)O-$  group (i.e., sulfates):**

This subclass is indented under subclass 388. Compositions wherein the sulfur is present as part of a sulfate,  $-O-S(=O)(=O)O-$ , group.

- (1) Note. An example of a component provided for herein is sodium dodecyl sulfate,



**390 The sulfur is part of an  $-O-S(=O)(=O)-$  group (i.e., sulfonates):**

This subclass is indented under subclass 388. Compositions wherein the sulfur is present as part of a sulfonate,  $-S(=O)(=O)O-$ , group.

- (1) Note. Examples of components provided for herein are light metal dinonyl naph-

thalene sulfonates and light metal mahogany sulfonates.

**391 Overbased or carbonated sulfonates:**

This subclass is indented under subclass 390. Compositions wherein the organic  $-S(=O)(=O)O-$  compound is an overbased or carbonated sulfonic acid.

- (1) Note. An overbased compound herein is one in which an amount of metal (e.g., Mg, Ca, Ba, Sr) is present which is greater than the stoichiometric amount of metal which would be present if the sulfonic acid were completely neutralized.
- (2) Note. A carbonated compound herein is the complex resulting from the reaction of carbon dioxide with metal sulfonates.

**392 Prepared by addition of carbon dioxide, carbonic acid, or salt thereof to a reaction mixture containing alkylphenol, substituted alkylphenol or salt thereof and sulfonic acid or salt thereof:**

This subclass is indented under subclass 391. Compositions wherein the overbased or carbonated sulfonate is prepared by forming a reaction mixture containing (1) a sulfonic acid or a salt thereof, and (2) an alkylphenol, a substituted alkylphenol or a salt thereof, and adding to said reaction mixture one of carbon dioxide, carbonic acid, or a salt thereof.

**393 Prepared by chemical reaction of existing overbased sulfonate in the absence of additional base (e.g., converting overbased sulfonate to non-newtonian or thixotropic composition; further reacting overbased sulfonate with carboxylic acid, etc.):**

This subclass is indented under subclass 391. Compositions wherein the overbased or carbonated sulfonate is prepared by chemically reacting a previously formed overbased sulfonate, which chemical reacting takes place in the absence of any additional base.

**394 Prepared with, or in the presence of, a halogen containing material:**

This subclass is indented under subclass 391. Compositions wherein the overbased or carbonated sulfonate is prepared (1) by reacting a

- halogen containing material, or (2) in the presence of a halogen containing material.
- 395 Prepared by addition of carbon dioxide, carbonic acid, or salt thereof to a reaction mixture prior to addition of sulfonic acid or salt thereof (i.e., carbonating reaction mixture prior to addition of sulfonic acid or salt thereof):**  
This subclass is indented under subclass 391. Compositions wherein the overbased or carbonated sulfonate is prepared by adding a sulfonic acid or salt thereof to a reaction mixture in which carbon dioxide, carbonic acid, or a salt thereof is already present.
- 396 Prepared with, or in the presence of, a nitrogen containing material:**  
This subclass is indented under subclass 391. Compositions wherein the overbased or carbonated sulfonate is prepared (1) by reacting a nitrogen containing material, or (2) in the presence of a nitrogen containing material.
- 397 The nitrogen containing material is an ammonium salt or a substituted ammonium salt:**  
This subclass is indented under subclass 396. Compositions wherein an ammonium salt or a substituted ammonium salt serves as the nitrogen containing material.
- 398 With nonhydrocarbon organic compound in addition to those remaining from overbasing process (e.g., antioxidants, VI improvers, etc.):**  
This subclass is indented under subclass 391. Compositions which contain, in addition to the overbased or carbonated sulfonate and any material remaining from the overbasing process, an organic compound that is not a hydrocarbon.
- (1) Note. This subclass is designed to encompass compositions which include (1) overbased or carbonated sulfonates, (2) any materials remaining from the overbasing process and (3) additional additives, which are nonhydrocarbon organic compounds.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 399 The compound is an organic nitrogen compound:**  
This subclass is indented under subclass 398. Compositions wherein the nonhydrocarbon organic compound contains nitrogen which is attached directly or indirectly by nonionic bonding to carbon of the organic compound.
- 400 The compound is a carboxylic acid ester (e.g., as lubricant base, etc.):**  
This subclass is indented under subclass 398. Compositions wherein a carboxylic acid ester is the nonhydrocarbon organic compound.
- 401 Prepared by addition of carbon dioxide, carbonic acid, or salt thereof:**  
This subclass is indented under subclass 391. Compositions wherein the overbased or carbonated sulfonate is prepared by addition of carbon dioxide, carbonic acid, or a salt thereof to a reaction mixture containing a sulfonic acid or salt thereof, or by simultaneous addition of (1) carbon dioxide, carbonic acid, or a salt thereof and (2) sulfonic acid or salt thereof to a reaction mixture.
- (1) Note. The reaction mixture may not contain alkylphenol, substituted alkylphenol, or a salt thereof. Such processes are provided for in subclass 392, *supra*.
- 402 Multiple additions thereof:**  
This subclass is indented under subclass 401. Compositions wherein the overbased or carbonated sulfonate is prepared by a process utilizing multiple, separate additions of carbon dioxide, carbonic acid, or a salt thereof.
- 403 The single bonded oxygen is bonded directly to carbon (e.g., sulfonate esters, etc.):**  
This subclass is indented under subclass 390. Compositions wherein carbon is bonded directly to the single bonded oxygen of the -S(=O)(=O)O- group.
- (1) Note. This subclass encompasses primarily sulfonic acid esters.
- (2) Note. An example of a component provided for herein is  $C_6H_5-SO_2OC_5H_{11}$ , benzene sulfonic acid, amyl ester.

**404 Nitrogen attached directly or indirectly to the sulfonate group by nonionic bonding:**

This subclass is indented under subclass 390. Compositions wherein the sulfonate group is attached directly or indirectly to nitrogen by nonionic bonding.

- (1) Note. Examples of components provided for herein are sulfamic acids and

**405 Non-sulfonate chalcogen attached indirectly to the sulfonate group by nonionic bonding:**

This subclass is indented under subclass 390. Compositions wherein the sulfonate group is attached indirectly by nonionic bonding to chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) that is not part of a sulfonate group.

- (1) Note. An example of a component provided for herein is
- $$\text{CH}_3\text{OC(O)CH(SO}_3\text{H)CH}_2\text{C(O)O H}_3$$

**406 Halogen attached indirectly to the sulfonate group by nonionic bonding:**

This subclass is indented under subclass 390. Compositions wherein the sulfonate group is attached indirectly to halogen by nonionic bonding.

- (1) Note. An example of a component provided for herein is  $\text{CF}_3\text{SO}_2\text{OLi}$ .

**407 With rosin, tall oil, or derivatives thereof of indeterminate structure:**

This subclass is indented under subclass 390. Compositions which contain, in addition to the sulfonate group containing compound, rosin, tall oil, or derivatives of indeterminate structure thereof.

- (1) Note. If an additional component is identified as fatty acid(s) or abietic acid(s) of known structure derived from rosin or tall oil, such acids are classified on the basis of their structure. If the acids are identified solely by reference to their source, they are classified here.

**408 With organic phosphorus compound (e.g., phosphate esters, etc.):**

This subclass is indented under subclass 390. Compositions which contain, in addition to the sulfonate group containing compound, an organic phosphorus compound.

- (1) Note. An organic phosphorus compound is one wherein phosphorus is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.

**409 With carboxylic acid ester:**

This subclass is indented under subclass 390. Compositions which contain, in addition to the sulfonate group containing compound, a carboxylic acid ester.

**410 Organic nitrogen compound salt of a sulfonic acid, or an organic nitrogen compound is present:**

This subclass is indented under subclass 390. Compositions which (1) contain, in addition to the sulfonate group containing compound, an organic nitrogen compound or (2) which contain an organic nitrogen compound salt of a sulfonic acid.

- (1) Note. An organic nitrogen compound is one wherein nitrogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.

**411 The organic nitrogen compound is a guanidine or a carboxylic acid amide:**

This subclass is indented under subclass 410. Compositions wherein the organic nitrogen compound is a carboxylic acid amide or a guanidine.

- (1) Note. A guanidine is  $\text{NH}_2\text{-C(=NH)NH}_2$ , wherein substitution may be made for hydrogen only.

- 412 Chalcogen attached indirectly to the nitrogen by nonionic bonding (e.g., trialkanolamines, phenol-aldehyde-amine condensates, etc.):**  
This subclass is indented under subclass 410. Compositions wherein the nitrogen is attached indirectly by nonionic bonding to chalcogen (i.e., oxygen, sulfur, selenium, or tellurium).
- 413 With organic -C(=O)O- compound:**  
This subclass is indented under subclass 390. Compositions which contain, in addition to the sulfonate containing compound, an organic -C(=O)O- compound.
- (1) Note. An organic -C(=O)O- compound is one wherein the carbon of the -C(=O)O- group is, or is attached directly or indirectly by nonionic bonding to, carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 414 Ring bonded directly to the carbon of the -C(=O)O- group (e.g., phthalates, naphthenates, etc.):**  
This subclass is indented under subclass 413. Compositions wherein the -C(=O)O- carbon is bonded directly to a ring.
- 415 With compound having alcoholic or phenolic -OH, or salt thereof:**  
This subclass is indented under subclass 413. Compositions which contain, in addition to the organic -C(=O)O- compound and the sulfonate containing compound, a compound having an alcoholic or phenolic hydroxyl group, or a salt thereof.
- 416 With organic halogen or non-sulfonate chalcogen compound (e.g., haloparaffins, ethers, ketones, polyols, etc.):**  
This subclass is indented under subclass 390. Compositions which contain, in addition to the sulfonate containing compound, an organic halogen compound or an organic chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) compound that does not contain a sulfonate group.
- (1) Note. An organic halogen compound is one wherein halogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound. Organic chalcogen compound is similarly defined.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 417 The non-sulfonate chalcogen compound is a phenol, or salt thereof:**  
This subclass is indented under subclass 416. Compositions wherein the organic chalcogen compound that does not contain a sulfonate group is a phenol or a salt of a phenol.
- 418 Aluminum or heavy metal sulfonate salt:**  
This subclass is indented under subclass 390. Compositions which contain a heavy metal or an aluminum salt of a sulfonic acid.
- (1) Note. Arsenic is considered a heavy metal.
- (2) Note. Heavy metals are those whose specific gravity is greater than 4.0.
- 419 Compound of indeterminate structure, prepared by reacting a compound having phosphorus single bonded directly to chalcogen by nonionic bonding and attached directly or indirectly to carbon by nonionic bonding (e.g., by reaction of phosphorus acids and esters, etc.):**  
This subclass is indented under subclass 110. Compositions which contain a compound of indeterminate structure, said compound being prepared by the reaction of a compound wherein chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) is single bonded directly to phosphorus by nonionic bonding, which phosphorus is attached directly or indirectly to carbon by nonionic bonding.
- 420 A nitrogen compound is reacted with the phosphorus compound:**  
This subclass is indented under subclass 419. Compositions wherein the phosphorus compound is reacted with a nitrogen compound.

**421 Organic phosphorus compound, wherein the phosphorus is single bonded directly to chalcogen by nonionic bonding (e.g., phosphorus acids, esters, etc.):**

This subclass is indented under subclass 110. Compositions which contain an organic phosphorus compound wherein phosphorus is (1) single bonded directly to chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) by nonionic bonding and is (2) attached directly or indirectly by nonionic bonding to carbon of an organic compound.

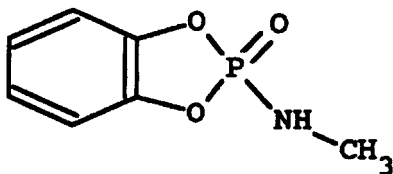
(1) Note. See Notes to the Class Definition for the definition of an organic compound.

(2) Note. An example of a component provided for herein is  $(C_6H_5)_2P-O-C_6H_5$

**422 The phosphorus is in a ring:**

This subclass is indented under subclass 421. Compositions wherein the phosphorus is a member of a ring.

(1) Note. An example of a component provided for herein is



**423 Additional phosphorus attached directly or indirectly to the phosphorus by nonionic bonding:**

This subclass is indented under subclass 421. Compositions wherein an additional phosphorus is attached directly or indirectly to the phosphorus by nonionic bonding.

(1) Note. An example of a component provided for herein is  $[(C_6H_5O)_2P-OCH_2]_4C$

**424 Plural phosphori bonded to the same chalcogen or chain of chalcogens (e.g., pyrophosphates, etc.):**

This subclass is indented under subclass 423. Compositions wherein a single chalcogen or a chain of chalcogens is bonded to plural phosphori.

(1) Note. An example of a component provided for herein is  $[(C_2H_5O)_2P(S)S-]_3P$

**425 Nitrogen attached directly or indirectly to the phosphorus by nonionic bonding:**

This subclass is indented under subclass 423. Compositions wherein the phosphorus is attached directly or indirectly to nitrogen by nonionic bonding.

(1) Note. An example of a component provided for herein is  $[(C_6H_5O)_2P(O)]_2NC_{12}H_{25}$

**426 Having -C(=O)O- attached indirectly to the phosphorus by nonionic bonding:**

This subclass is indented under subclass 423. Compositions wherein the phosphorus is attached indirectly to -C(=O)O- by nonionic bonding.

(1) Note. An example of a component provided for herein is



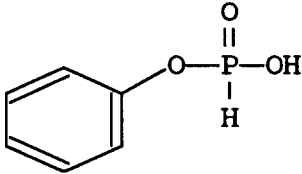
**427 Nitrogen or halogen bonded directly to the phosphorus:**

This subclass is indented under subclass 421. Compositions wherein the phosphorus is bonded directly to nitrogen or to halogen.

(1) Note. Examples of components provided for herein are  $(CH_3O)_2PNHCOOC_2H_5$  and  $CCl_3P(O)(OH)Cl$

**428 Nitrogen attached indirectly to the phosphorus by nonionic bonding (e.g., phosphatides, etc.):**

This subclass is indented under subclass 421. Compositions wherein the phosphorus is attached indirectly to nitrogen by nonionic bonding.

- (1) Note. An example of a component provided for herein is  $C_7H_{15}CONHCH_2PO_3H_2$
- 429 Chalcogen attached indirectly to the phosphorus by nonionic bonding:**  
This subclass is indented under subclass 421. Compositions wherein the phosphorus is attached indirectly to chalcogen by nonionic bonding.
- (1) Note. An example of a component provided for herein is
- $$(CH_3O)_2P(S)SCH_2CH_2OH$$
- 430 The chalcogen, X, is part of a -C(=X)-group:**  
This subclass is indented under subclass 429. Compositions wherein the chalcogen, designated by X, is part of a -C(=X)- group.
- (1) Note. An example of a component provided for herein is  $S=P(SCH_2COOCH_3)_3$
- 431 Plural carbons bonded directly to the chalcogen or to a chain of chalcogens:**  
This subclass is indented under subclass 429. Compositions wherein the chalcogen or a chain of chalcogens is bonded directly to plural carbons.
- (1) Note. An example of a component provided for herein is  $[C_8H_{17}(OCH_2CH_2)_3-O]_3P=O$
- 432 The chalcogen is sulfur, or the chain of chalcogens is a chain of sulfurs:**  
This subclass is indented under subclass 431. Compositions wherein sulfur is the chalcogen, or a chain of sulfurs is the chain of chalcogens.
- (1) Note. Examples of components provided for herein are  $O=P(OCH_2SCH_3)_3$  and  $C_{10}H_{21}-S-S-CH_2P(O)(OCH_3)_2$
- 433 Divalent chalcogen double bonded directly to the phosphorus:**  
This subclass is indented under subclass 421. Compositions wherein the phosphorus of the organic phosphorus compound is double bonded directly to divalent chalcogen.
- (1) Note. An example of a component provided for herein is  $ClC_6H_4O-P(S)(OCH_3)_2$
- 434 Hydrogen bonded directly to the phosphorus:**  
This subclass is indented under subclass 433. Compositions wherein the phosphorus is bonded directly to hydrogen.
- (1) Note. An example of component provided for herein is
- 
- 435 Phosphorus acid salt with metal or ammonia (e.g., overbased or carbonated phosphorus acids, etc.):**  
This subclass is indented under subclass 433. Compositions wherein the organic phosphorus compound is a phosphorus acid in the form of its salt with metal or ammonia.
- 436 Organic nitrogen compound salt of phosphorus acid, or organic nitrogen compound is present with phosphorus acid:**  
This subclass is indented under subclass 433. Compositions which (1) contain, in addition to the organic phosphorus compound present as a phosphorus acid, an organic nitrogen compound or (2) wherein the organic phosphorus compound is in the form of an organic nitrogen compound salt of an organic phosphorus acid.
- (1) Note. An organic nitrogen compound is one wherein nitrogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.

- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 437 With organic -C(=O)O- compound:**  
This subclass is indented under subclass 436. Compositions which contain, in addition to the component of subclass 436, an organic -C(=O)O- compound.
- (1) Note. An organic -C(=O)O- compound is one wherein the carbon of the -C(O)O- group is, or is attached directly or indirectly by nonionic bonding to, the carbon of an organic compound.
- (1) Note. See Notes to the Class Definition for the definition of an organic compound.
- 438 With organic nitrogen, sulfur, or halogen compound:**  
This subclass is indented under subclass 433. Compositions which contain, in addition to the organic phosphorus compound, an organic nitrogen compound, an organic sulfur compound, or an organic halogen compound.
- (1) Note. An organic nitrogen compound is one wherein nitrogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound. Organic sulfur compound and organic halogen compound are similarly defined.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 439 With organic -C(=O)O- compound:**  
This subclass is indented under subclass 438. Compositions which contain, in addition to the organic phosphorus compound and the organic nitrogen compound, organic sulfur compound or organic halogen compound, an organic -C(=O)O- compound.
- (1) Note. An organic -C(=O)O- compound is one wherein the carbon of the -C(=O)O- group is, or is attached directly or indirectly by nonionic bonding to, the carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 440 With organic -C(=O)O- compound:**  
This subclass is indented under subclass 433. Compositions which contain, in addition to the organic phosphorus compound, an organic -C(=O)O- compound.
- (1) Note. An organic -C(=O)O- compound is one wherein the carbon of the -C(=O)O- group is, or is attached directly or indirectly by nonionic bonding to, the carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 441 Three divalent chalcogens single bonded directly to trivalent phosphorus:**  
This subclass is indented under subclass 421. Compositions wherein the phosphorus of the organic phosphorus compound is trivalent and is single bonded directly to three divalent chalcogens.
- (1) Note. The principal type of component provided for herein is phosphite esters, of the general formula  $P(OR)_3$ .
- 442 With organic chalcogen or nitrogen compound:**  
This subclass is indented under subclass 441. Compositions which contain, in addition to the organic phosphorus compound, an organic chalcogen compound or an organic nitrogen compound.
- (1) Note. An organic chalcogen compound is one wherein chalcogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound. Organic nitrogen compound is similarly defined.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.

**443 Organic -C(=X)X- compound, wherein the X's are the same or diverse chalcogens, with at least one X being sulfur:**

This subclass is indented under subclass 110. Compositions which contain a compound wherein the carbon of a -C(=X)X- group is, or is attached directly or indirectly by nonionic bonding to, the carbon of an organic compound, and wherein the X's may be the same or diverse chalcogens (i.e., oxygen, sulfur, selenium, or tellurium), with at least one X being sulfur.

- (1) Note. See Notes to the Class Definition for the definition of an organic compound.
- (2) Note. Examples of components provided for herein are:  $C_5H_{11}-C(O)S-SC(O)C_5H_{11}$ ; and  $(C_6H_5CSS)_2Ca$

**444 The single bonded chalcogen is bonded directly to an additional carbon, which carbon may be single bonded to any atom but may be multiple bonded only to carbon (i.e., thiocarboxy esters):**

This subclass is indented under subclass 443. Compositions wherein an additional carbon, which may be single bonded to any atom but may be multiple bonded only to carbon, is bonded directly to the single bonded X.

- (1) Note. The components provided for herein are esters of thiocarboxy compounds.
- (2) Note. An example of a component provided for herein is:  $C_8H_{17}-C(O)S-CH_2-C(O)OCH_3$

**445 Chalcogen bonded directly to the carbon of the -C(=X)X-group (e.g., xanthate esters, trithiocarbonate esters, etc.):**

This subclass is indented under subclass 444. Compositions wherein the carbon of the -C(=X)X- group is bonded directly to an additional chalcogen.

- (1) Note. An example of a component provided for herein is:  $CH_3-O-C(S)-S-CH_3$

**446 Compound of indeterminate structure, prepared by reacting an organic cyano or isocyano compound of known structure:**

This subclass is indented under subclass 110. Compositions which contain a compound of indeterminate structure, prepared by the reaction of an organic cyano compound or an organic isocyano compound of known structure.

- (1) Note. An organic cyano or isocyano compound is one wherein a cyano group (-CN) or an isocyano group (-N=C) is attached directly or indirectly to carbon of an organic compound by nonionic bonding.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.

**447 Organic cyano or isocyano compound:**

This subclass is indented under subclass 110. Compositions which contain a compound wherein a cyano group (-CN) or an isocyano group (-N=C) is attached directly or indirectly to carbon of an organic compound by nonionic bonding.

- (1) Note. See Notes to the Class Definition for the of an organic compound.
- (2) Note. An example of a component provided for herein is benzonitrile.

**448 Nitrogen attached directly or indirectly to the cyano group by nonionic bonding:**

This subclass is indented under subclass 447. Compositions wherein the cyano group is attached directly or indirectly to nitrogen by nonionic bonding.

- (1) Note. Examples of components provided for herein are  $CN-CH_2-CONH_2$  and  $NC-CH_2CH_2-CN$

**449 Rosin, tall oil, or derivatives of indeterminate structure thereof:**

This subclass is indented under subclass 110. Compositions which contain rosin, tall oil, or derivatives of indeterminate structure thereof.

- (1) Note. If a component is identified as fatty acid(s) or abietic acid(s) of known structure derived from rosin or tall oil, such acids are classified on the basis of their structure. If the acids are identified solely by reference to their source, they are classified here.
- 450 Purified or chemically reacted naturally occurring carboxylic acid ester wax (e.g., acidolized, hydrogenated, halogenated, etc.):**  
This subclass is indented under subclass 110. Compositions which contain a naturally occurring carboxylic acid ester wax that has been chemically reacted or that has been purified.
- (1) Note. Examples of naturally occurring carboxylic acid ester waxes are lanolin, carnauba wax, beeswax, and spermaceti.
- 451 Naturally occurring carboxylic acid ester wax (e.g., carnauba wax, lanolin, beeswax, etc.):**  
This subclass is indented under subclass 110. Compositions which contain a naturally occurring carboxylic acid ester wax.
- (1) Note. To be classified herein, a component must be characterized as a naturally occurring carboxylic acid ester wax, or must be a substance known to be a naturally occurring carboxylic acid ester wax.
- (2) Note. Examples of known naturally occurring carboxylic acid ester waxes are lanolin, beeswax, carnauba oil, and spermaceti.
- 452 Compound of indeterminate structure, prepared by reacting an organic -C(=O)O- compound of known structure:**  
This subclass is indented under subclass 110. Compositions which contain a compound of indeterminate structure, prepared by the reaction of an organic-C(=O)O- compound of known structure.
- (1) Note. An organic -C(=O)O- compound is one in which the carbon of the -C(=O)O- group is, or is attached directly or indirectly by nonionic bonding to, the carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 453 An aldehyde or azomethine is reacted with the -C(=O)O- compound:**  
This subclass is indented under subclass 452. Compositions wherein the -C(=O)O- compound is reacted with an aldehyde or with an azomethine.
- (1) Note. An azomethine is a compound of the type:
- $$\begin{array}{c} \text{R}' \\ | \\ \text{R}-\text{C}=\text{N}-\text{R}'' \end{array}$$
- 454 A nitrogen compound is reacted with the -C(=O)O- compound:**  
This subclass is indented under subclass 452. Compositions wherein the -C(=O)O- compound is reacted with a compound that contains nitrogen.
- 455 A polyhydroxy compound is reacted with the -C(=O)O- compound:**  
This subclass is indented under subclass 452. Compositions wherein the -C(=O)O- compound is reacted with a compound that contains plural hydroxy groups.
- 456 Polymerized triglycerides:**  
This subclass is indented under subclass 452. Compositions wherein the compound of indeterminate structure is a polymerized triglyceride.
- 457 Benzene ring compound reacted with the -C(=O)O- compound:**  
This subclass is indented under subclass 452. Compositions wherein the -C(=O)O- compound is reacted with a compound that contains a benzene ring.
- 458 A reactant contains halogen:**  
This subclass is indented under subclass 452. Compositions wherein halogen is present in a reactant.

**459 Organic -C(=O)O- compound:**

This subclass is indented under subclass 110. Compositions which contain a compound wherein the carbon of a -C(=O)O- group is, or is attached directly or indirectly by nonionic bonding to, the carbon of an organic compound.

- (1) Note. See Notes to the Class Definition for the definition of an organic compound.
- (2) Note. Examples of components provided for herein are oleic acid and stearic acid.

**460 Overbased or carbonated carboxylates:**

This subclass is indented under subclass 459. Compositions wherein the organic -C(=O)O- compound is an overbased or carbonated carboxylic acid.

- (1) Note. An overbased compound herein is one in which an amount of metal (e.g., Mg, Ca, Ba, Sr) is present which is greater than the stoichiometric amount of metal which would be present if the carboxylic acid were completely neutralized.
- (2) Note. A carbonated compound herein is the complex resulting from the reaction of carbon dioxide with metal carboxylates.

**461 Phosphorus attached indirectly to the -C(=O)O- group by nonionic bonding:**

This subclass is indented under subclass 459. Compositions wherein the -C(=O)O- group is attached indirectly to phosphorus by nonionic bonding.

- (1) Note. An example of a component provided for herein is:  

$$\text{O}=\text{P}(\text{CH}_2\text{CH}_2\text{COOCH}_2\text{CH}_3)_3$$

**462 Additional chalcogen bonded directly to the carbon or the oxy of the -C(=O)O- group (i.e., carbonates, percarboxylates):**

This subclass is indented under subclass 459. Compositions wherein the oxy or the carbon of the -C(=O)O- group is bonded directly to additional chalcogen (i.e., oxygen, sulfur, selenium, or tellurium).

- (1) Note. Examples of components provided for herein are:  $\text{C}_6\text{H}_{11}\text{-O-C(O)-O-C}_6\text{H}_{11}$  and  $\text{C}_6\text{H}_5\text{-C(O)-O-O-C(CH}_3)_3$

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 445, for components which contain an organic -S-C(=O)O- ester compound

**463 Specified compound wherein the single bonded oxygen is bonded directly to an additional carbon, which carbon may be single bonded to any atom but may be multiple bonded only to carbon (i.e., specified carboxylic acid ester):**

This subclass is indented under subclass 459. Compositions which contain a specified compound wherein an additional carbon is bonded directly to the single bonded oxygen, which carbon may be single bonded to any atom but may be multiple bonded only to carbon.

- (1) Note. This subclass encompasses carboxylic acid esters.
- (2) Note. The expression "specified compound" means that a carboxylic acid ester lubricant base component, in order to be classified in this subclass or its indents, must be structurally identified to the point where the component can be placed in this subclass or a specific indent on the basis of a complete structure. This structure may be expressed generically or specifically, but it must be expressed in the claims. Such descriptions as "ester," "carboxylic acid ester," "aryl ester," "aliphatic ester," "substituted carboxylic acid ester," etc. will not be deemed sufficient to warrant classification in this subclass or its indents. A generically expressed structure which would be properly classifiable herein may be exemplified by "an alkyl benzoate, substituted in the alkyl portion by halogen, amino or alkoxy." Such a generic expression allows identification of exact substances within its scope.

When a carboxylic acid ester is present as a lubricant additive rather than as a lubricant base, placement of such an

additive will be effected in the normal manner.

**464 Nitrogen bonded directly to the carbon of the -C(=O)O- group:**

This subclass is indented under subclass 463. Compositions wherein the carbon of the -C(=O)O- group is bonded directly to nitrogen.

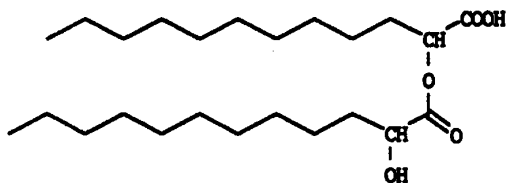
- (1) Note. An example of a component provided for herein is



**465 Plural -C(=O)O- groups attached directly or indirectly to each other by nonionic bonding (e.g., estolides of hydroxy carboxylic acids, etc.):**

This subclass is indented under subclass 463. Compositions wherein an additional -C(=O)O- group is attached directly or indirectly to the -C(=O)O- group by nonionic bonding.

- (1) Note. The additional -C(=O)O- group does not have to be present as part of a carboxylic acid ester group.
- (2) Note. An example of a component provided for herein is



**466 Polymer of alpha, beta-olefinically unsaturated dicarboxylic acid ester monomer, or of esterified alpha, beta-olefinically unsaturated dicarboxylic acid or anhydride monomer (e.g., copolymer of maleic acid ester and vinyl alkyl ether, etc.):**

This subclass is indented under subclass 465. Compositions wherein the compound having plural -C(=O)O- groups is a polymer prepared from an alpha,beta-olefinically unsaturated dicarboxylic acid ester monomer, or from an alpha, beta-olefinically unsaturated dicarboxylic acid or anhydride monomer which is esterified before, during, or after polymerization.

- (1) Note. The monomers are normally addition polymerized through the olefinic double bond.
- (2) Note. The polymers encompassed herein may be homopolymers or copolymers.
- (3) Note. Typical alpha, beta-olefinically unsaturated dicarboxylic ester monomers are maleates and fumarates.

**467 Monocarboxylic acid ester of olefinically unsaturated alcohol is an additional monomer of the polymer (e.g., dialkyl fumarate-vinyl acetate copolymer, etc.):**

This subclass is indented under subclass 466. Compositions wherein a monomer that is a monocarboxylic acid ester of an olefinically unsaturated alcohol forms a copolymer with the alpha, beta-olefinically unsaturated dicarboxylic monomer.

- (1) Note. More than two discrete olefinically unsaturated monomers may form terpolymers, etc.
- (2) Note. A typical monocarboxylic acid ester of an olefinically unsaturated alcohol is vinyl acetate.

**468 Olefin or alpha, beta-olefinically unsaturated carboxylate is an additional monomer of the polymer (e.g., fumarate-ethylene or fumarate-acrylate copolymers, etc.):**

This subclass is indented under subclass 466. Compositions wherein an olefin monomer or an alpha, beta-olefinically unsaturated carboxylate monomer forms a copolymer with the alpha, beta-olefinically unsaturated dicarboxylic monomer.

- (1) Note. More than two discrete olefinically unsaturated monomers may form terpolymers, etc.
- (2) Note. The alpha, beta-olefinically unsaturated carboxylate is typically an acrylate.

**469 Polymer of alpha, beta-olefinically unsaturated carboxylate monomer (e.g., polymethylmethacrylate, etc.):**

This subclass is indented under subclass 465. Compositions wherein the compound having plural  $-C(=O)O-$  groups is a polymer prepared from an alpha, beta-olefinically unsaturated carboxylate monomer.

- (1) Note. The monomers are normally addition polymerized through the olefinic double bonds.
- (2) Note. The polymers encompassed herein may be homopolymers or copolymers.
- (3) Note. Methyl methacrylate is a typical alpha, beta-olefinically unsaturated carboxylate monomer.

**470 Nitrogen attached indirectly to the  $-C(=O)O-$  groups by nonionic bonding (e.g., lauryl methacrylate-diethylaminomethylacryl copolymer, etc.):**

This subclass is indented under subclass 469. Compositions wherein the  $-C(=O)O-$  groups of the polymer are attached indirectly to nitrogen by nonionic bonding.

**471 Having  $-C(=X)-$ , wherein X is chalcogen, bonded directly to the nitrogen (e.g., acrylamide-methyl acrylate copolymer, etc.):**

This subclass is indented under subclass 470. Compositions wherein the nitrogen is bonded directly to  $-C(=X)-$ , wherein X is chalcogen (i.e., oxygen, sulfur, selenium, or tellurium).

**472 Olefinically unsaturated compound that is not a carboxylic acid ester is an additional monomer of the polymer (e.g., ethylene-ethyl acrylate copolymer, etc.):**

This subclass is indented under subclass 469. Compositions wherein an olefinically unsaturated compound monomer that is not a carboxylic acid ester forms a copolymer with the alpha, beta-olefinically unsaturated carboxylate monomer.

- (1) Note. More than two discrete olefinically unsaturated monomers may form terpolymers, etc.

**473 With hydrocarbon polymer, carboxylic acid, or carboxylic acid salt:**

This subclass is indented under subclass 469. Compositions which contain, in addition to the polymer of the alpha, beta olefinically unsaturated carboxylate monomer, a carboxylic acid, a carboxylic acid salt, or a hydrocarbon polymer.

**474 With non-acrylate organic chalcogen compound:**

This subclass is indented under subclass 469. Compositions which contain, in addition to the polymer of the alpha, beta-olefinically unsaturated carboxylate monomer, an organic chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) compound that is not an acrylate.

- (1) Note. An organic chalcogen compound is one wherein chalcogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- (3) Note. An acrylate has the basic structure  $H_2C=CH-C(=O)O-$ , wherein substitution may be made for hydrogen only.

**475 Polymer of monocarboxylic acid ester of olefinically unsaturated alcohol (e.g., ethylene-vinyl acetate copolymer, etc.):**

This subclass is indented under subclass 465. Compositions wherein the compound having plural  $-C(=O)O-$  groups is a polymer prepared from a monocarboxylic acid ester of an olefinically unsaturated alcohol.

- (1) Note. The monomers are normally addition polymerized through the olefinic double bonds.
- (2) Note. The polymers encompassed herein may be homopolymers or copolymers.
- (3) Note. Vinyl acetate is a typical monocarboxylic acid ester of an olefinically unsaturated alcohol.

**476 Nitrogen attached indirectly to the -C(=O)O- groups by nonionic bonding:**

This subclass is indented under subclass 465. Compositions wherein the -C(=O)O- groups are attached indirectly to nitrogen by nonionic bonding.

**477 Benzene ring, chalcogen, or -C(=X)-, wherein X is chalcogen, attached directly to the nitrogen by nonionic bonding:**

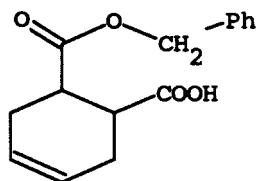
This subclass is indented under subclass 476. Compositions wherein the nitrogen is attached directly to a benzene ring, chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) or -C(=X)-, wherein X is chalcogen, by nonionic bonding.

- (1) Note. An example of a component provided for herein is

**478 Benzene ring attached directly or indirectly to the -C(=O)O- groups by nonionic bonding:**

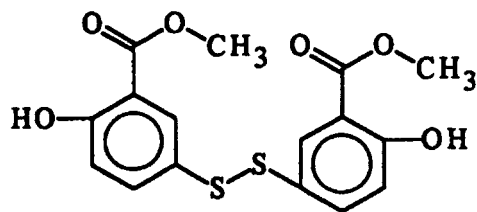
This subclass is indented under subclass 465. Compositions wherein the -C(=O)O- groups are attached directly or indirectly to a benzene ring by nonionic bonding.

- (1) Note. An example of a component provided for herein is

**479 The benzene ring is bonded directly to carbon of a -C(=O)O- group:**

This subclass is indented under subclass 478. Compositions wherein carbon of a -C(=O)O- group is bonded directly to the benzene ring.

- (1) Note. An example of a component provided for herein is

**480 Carbons of plural -C(=O)O- groups are bonded directly to the same benzene ring (e.g., vanadium salt of oleyl acid phthalate, etc.):**

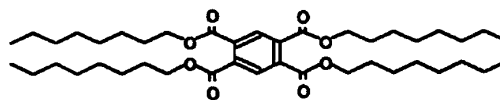
This subclass is indented under subclass 479. Compositions wherein the benzene ring is bonded directly to carbons of plural -C(=O)O- groups.

- (1) Note. Phthalic acid monoesters are typical of the components provided for herein.

**481 Three or more -C(=O)O- groups attached indirectly to each other by nonionic bonding:**

This subclass is indented under subclass 480. Compositions wherein more than two -C(=O)O- groups are attached indirectly to each other by nonionic bonding.

- (1) Note. An example of a component provided for herein is

**482 Phthalic acid dialkyl ester:**

This subclass is indented under subclass 480. Compositions which contain dialkyl esters of phthalic acid.

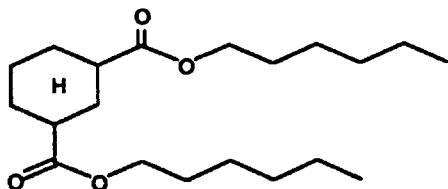
- (1) Note. Phthalic acid is o-benzene dicarboxylic acid.

**483 The benzene ring is bonded directly to the single bonded oxygen of a -C(=O)O- group:**  
This subclass is indented under subclass 478. Compositions wherein a -C(=O)O- group is bonded directly to the benzene ring through its single bonded oxygen.

- (1) Note. An example of a component provided for herein is  $[\text{CH}_3\text{C}(=\text{O})\text{O}-\text{C}_6\text{H}_4-\text{I}_2\text{S}]$

**484 Cycloaliphatic ring attached directly to carbon of a -C(=O)O- group:**  
This subclass is indented under subclass 465. Compositions wherein carbon of a -C(=O)O- group is bonded directly to a cycloaliphatic ring.

- (1) Note. An example of a component provided for herein is



**485 Esterified alcohol is polyhydroxy alcohol (e.g., pentaerythritol tetraalkanoate, etc.):**  
This subclass is indented under subclass 465. Compositions wherein a single bonded oxygen of one of the -C(=O)O- groups is the oxygen of an esterified polyhydroxy alcohol.

- (1) Note. An example of a component provided for herein is:  $\text{CH}_3\text{C}(=\text{O})\text{O}-(\text{CH}_2)_2-\text{O}-(\text{CH}_2)_2-\text{O}(\text{O}=\text{C})\text{CH}_3$

**486 Esterified polyhydroxy alcohol is glycerol (i.e., glycerides):**  
This subclass is indented under subclass 485. Compositions wherein glycerol is the polyhydroxy alcohol.

- (1) Note. An example of a component provided for herein is a halogenated triglyceride.

**487 With organic nitrogen or phosphorus compound:**

This subclass is indented under subclass 486. Compositions which contain, in addition to the specified carboxylic acid ester, an organic nitrogen compound or an organic phosphorus compound.

- (1) Note. An organic nitrogen compound is one wherein nitrogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound. Similar considerations apply to an organic phosphorus compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.

**488 With carboxylic acid or carboxylic acid salt:**  
This subclass is indented under subclass 486. Compositions which contain, in addition to the specified carboxylic acid ester, a carboxylic acid or a salt of a carboxylic acid.

**489 With organic non-carboxylic acid ester oxygen compound or halogen compound:**  
This subclass is indented under subclass 486. Compositions which contain, in addition to the specified carboxylic acid ester, an organic halogen compound or an organic oxygen compound that is not a carboxylic acid ester.

- (1) Note. An additional carboxylic acid ester may be present that is not the specified carboxylic acid ester of subclass 486, provided there is also present an organic halogen compound or an organic oxygen compound that is not a carboxylic acid ester.
- (2) Note. An organic oxygen compound is one wherein oxygen is attached directly or indirectly by nonionic bonding to carbon of an organic compound. An organic halogen compound is similarly defined.
- (3) Note. See Notes to the Class Definition for the definition of an organic compound.

**490 With hydrocarbon polymer:**

This subclass is indented under subclass 486. Compositions which contain, in addition to the specified carboxylic acid ester, a polymeric hydrocarbon.

**491 Naturally occurring triglyceride (e.g., tallow, castor oil, corn oil, etc.):**

This subclass is indented under subclass 486. Compositions which contain a naturally occurring triglyceride.

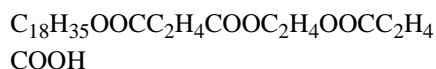
SEE OR SEARCH THIS CLASS, SUBCLASS:

486, for naturally occurring triglycerides that have been chemically treated.

**492 Polycarboxylic acid esterifies polyhydroxy alcohol:**

This subclass is indented under subclass 485. Compositions wherein the specified carboxylic acid ester is formed by the esterification of a polyhydroxy alcohol with a polycarboxylic acid.

- (1) Note. An example of a component provided for herein is:

**493 With organic non-carboxylic acid ester chalcogen compound, nitrogen compound, or halogen compound:**

This subclass is indented under subclass 492. Compositions which contain, in addition to the specified carboxylic acid ester, an organic nitrogen compound, an organic halogen compound, or an organic chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) compound that is not a carboxylic acid ester.

- (1) Note. An additional carboxylic acid ester may be present that is not the specified carboxylic acid ester of subclass 492, provided there is also present one of an organic nitrogen compound, an organic halogen compound, or an organic chalcogen compound that is not a carboxylic acid ester.

- (2) Note. An organic nitrogen compound is one wherein nitrogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound. Organic halogen compounds and organic chalcogen compounds are similarly defined.

- (3) Note. See Notes to the Class Definition for the definition of an organic compound.

**494 Ether or thioether chalcogen attached indirectly to the -C(=O)O- groups (e.g., polyethyleneglycol esters, etc.):**

This subclass is indented under subclass 492. Compositions wherein the -C(=O)O- groups are attached indirectly to an ether or thioether chalcogen.

**495 With organic non-carboxylic acid ester chalcogen compound or nitrogen compound:**

This subclass is indented under subclass 485. Compositions which contain, in addition to the specified carboxylic acid ester, an organic nitrogen compound or an organic chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) compound that is not a carboxylic acid ester.

- (1) Note. An additional carboxylic acid ester may be present that is not the specified carboxylic acid ester of subclass 485, provided there is also present one of an organic nitrogen compound or an organic chalcogen compound that is not a carboxylic acid ester.

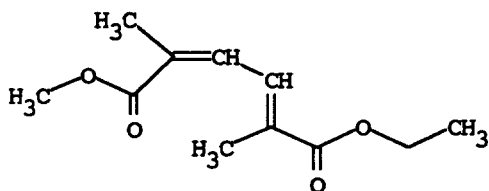
- (2) Note. An organic nitrogen compound is one wherein nitrogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound. An organic chalcogen compound is similarly defined.

- (3) Note. See Notes to the Class Definition for the definition of an organic compound.

**496 Mono-, di-, or polyester of polycarboxylic acid:**

This subclass is indented under subclass 465. Compositions wherein the specified carboxylic acid ester is a polycarboxylic acid ester which is mono-, di- or polyesterified.

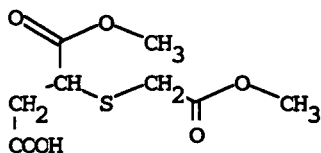
- (1) Note. An example of a component provided for herein is



**497 Non-carboxylate chalcogen attached indirectly to the -C(=O)O- groups by nonionic bonding (e.g., tartaric acid esters, etc.):**

This subclass is indented under subclass 496. Compositions wherein the -C(=O)O- groups are attached indirectly to a chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) that is not part of a -C(=O)O- group.

- (1) Note. An example of a component provided for herein is



**498 With carboxylic acid or carboxylic acid salt:**  
This subclass is indented under subclass 496. Compositions which contain, in addition to the specified carboxylic acid ester, a carboxylic acid or a carboxylic acid salt.

**499 With hydrocarbon polymer, organic halogen compound, or organic non-carboxylic acid ester chalcogen compound:**

This subclass is indented under subclass 496. Compositions which contain, in addition to the specified carboxylic acid ester, an organic halogen compound, a polymeric hydrocarbon or an organic chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) compound that is not a carboxylic acid ester.

- (1) Note. An additional carboxylic acid ester may be present that is not the specified carboxylic acid ester of subclass 496, provided there is also present one of an

organic halogen compound, a hydrocarbon polymer, or an organic chalcogen compound that is not a carboxylic acid ester.

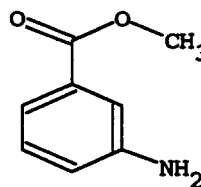
- (2) Note. An organic halogen compound is one wherein halogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound. An organic chalcogen compound is similarly defined.

- (3) Note. See Notes to the Class Definition for the definition of an organic compound.

**500 Nitrogen attached indirectly to the -C(=O)O- group by nonionic bonding:**

This subclass is indented under subclass 463. Compositions wherein the -C(=O)O- group is attached indirectly to nitrogen by nonionic bonding.

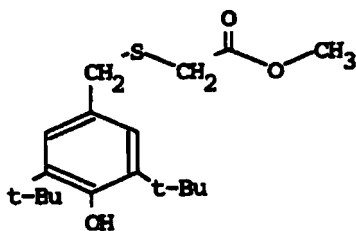
- (1) Note. An example of a component provided for herein is



**501 Chalcogen attached indirectly to the -C(=O)O- group by nonionic bonding (e.g., pentaerythritol monooleate, etc.):**

This subclass is indented under subclass 463. Compositions wherein the -C(=O)O- group is attached indirectly to chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) by nonionic bonding.

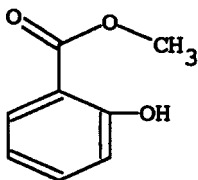
- (1) Note. An example of a component provided for herein is



**502 The chalcogen and the carbon of the -C(=O)O- group are bonded to a single benzene ring (e.g., salicylic acid esters, etc.):**

This subclass is indented under subclass 501. Compositions wherein a single benzene ring is bonded to the chalcogen and to the carbon of the -C(=O)O- group.

- (1) Note. An example of a component provided for herein is



**503 With carboxylic acid, carboxylic acid salt, or organic nitrogen compound:**

This subclass is indented under subclass 501. Compositions which contain, in addition to the specified carboxylic acid ester, a carboxylic acid, a carboxylic acid salt, or an organic nitrogen compound.

- (1) Note. An organic nitrogen compound is one wherein nitrogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.

**504 Halogen attached indirectly to the -C(=O)O- group by nonionic bonding:**

This subclass is indented under subclass 463. Compositions wherein the -C(=O)O- group is attached indirectly to halogen by nonionic bonding.

- (1) Note. An example of a component provided for herein is:  $\text{CCl}_3\text{-CHCl-CHCl-COOCH}_3$

**505 With hydrocarbon polymer or organic non-carboxylic acid ester oxygen compound (e.g., polybutene, dimer carboxylic acids, alcohols, etc.):**

This subclass is indented under subclass 463. Compositions which contain, in addition to the specified carboxylic acid ester, a polymeric hydrocarbon or an organic oxygen compound that is not a carboxylic acid ester.

- (1) Note. An additional carboxylic acid ester may be present that is not the specified carboxylic acid ester of subclass 463, provided that there is also present one of a polymeric hydrocarbon or an organic oxygen compound that is not a carboxylic acid ester.
- (2) Note. An organic oxygen compound is one wherein oxygen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (3) Note. See Notes to the Class Definition for the definition of an organic compound.

**506 Plural -C(=O)O- groups attached directly or indirectly to each other by nonionic bonding (e.g., alkyl succinic acid, linoleic acid dimer, etc.):**

This subclass is indented under subclass 459. Compositions wherein an additional -C(=O)O- group is attached directly or indirectly to the -C(=O)O- group by nonionic bonding.

- (1) Note. Examples of components provided for herein are oxalic acid and alkenyl succinic acid.

**507 Polymer of alpha, beta-olefinically unsaturated carboxylate monomer (e.g., acrylic acid-butadiene copolymer, etc.):**

This subclass is indented under subclass 506. Compositions wherein the plural -C(=O)O- groups are in a polymer prepared from an alpha, beta-olefinically unsaturated carboxylate monomer.

- (1) Note. The monomers are normally addition polymerized through the olefinic double bond.
- (2) Note. The polymers encompassed herein may be homopolymers or copolymers.
- (3) Note. Acrylic acid is a typical alpha, beta olefinically unsaturated carboxylate monomer.

**508 Nitrogen attached indirectly to the -C(=O)O- groups by nonionic bonding:**

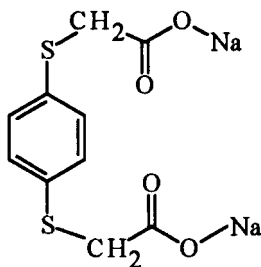
This subclass is indented under subclass 506. Compositions wherein the -C(=O)O- groups are attached indirectly to nitrogen by nonionic bonding.

- (1) Note. An example of a component provided for herein is  $C_{10}H_{21}-NH-C(=O)-N(CH_2COOH)_2$

**509 Halogen, sulfur, selenium, or tellurium attached indirectly to the -C(=O)O- groups by nonionic bonding:**

This subclass is indented under subclass 506. Compositions wherein the -C(=O)O- groups are attached indirectly to halogen, sulfur, selenium, or tellurium by nonionic bonding.

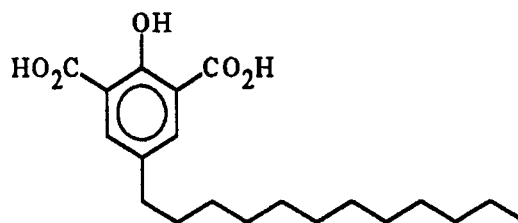
- (1) Note. An example of a component provided for herein is



**510 Non-carboxylate oxygen attached indirectly to the -C(=O)O- groups by nonionic bonding:**

This subclass is indented under subclass 506. Compositions wherein the -C(=O)O- groups are attached indirectly by nonionic bonding to oxygen that is not part of a -C(=O)O- group.

- (1) Note. An example of a component provided for herein is



**511 Organic nitrogen salt of a polycarboxylic acid, or with organic nitrogen compound:**

This subclass is indented under subclass 506. Compositions (1) which contain, in addition to the component having the additional -C(=O)O- group, an organic nitrogen compound, or (2) which contain an organic nitrogen compound salt of a polycarboxylic acid.

- (1) Note. An organic nitrogen compound is one wherein nitrogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.

**512 With organic monocarboxylate or non-carboxylate oxygen compound (e.g., phenols, polyethers, hydroxystearates, etc.):**

This subclass is indented under subclass 506. Compositions which contain, in addition to the component having the additional -C(=O)O- group, an organic oxygen compound that contains one -C(=O)O- group or no -C(=O)O- group.

- (1) Note. An organic oxygen compound is one wherein oxygen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.

**513 Nitrogen attached to the -C(=O)O- group directly or indirectly by nonionic bonding (e.g., carbamic acids, amino acids, etc.):**

This subclass is indented under subclass 459. Compositions wherein the -C(=O)O- group is attached directly or indirectly to nitrogen by nonionic bonding.

- (1) Note. Examples of components provided for herein are carbamic acids and 5-amino salicylic acid.

**514 Having additional -C(=O)- bonded directly to the nitrogen (e.g., N-lauroyl sarcosine, etc.):**

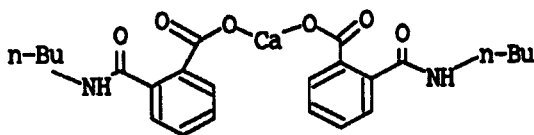
This subclass is indented under subclass 513. Compositions wherein the nitrogen is bonded directly to a -C(=O)- group that is not the -C(=O)- of the -C(=O)O- group.

- (1) Note. An example of a component provided for herein is  $\text{C}_8\text{H}_{17}\text{CON}(\text{CH}_3)\text{CH}_2\text{COOH}$

**515 The additional -C(=O)- is bonded directly to a benzene ring, or additional nitrogen is attached indirectly to the -C(=O)O- group by nonionic bonding (e.g., terephthalamates, polyamide acids, etc.):**

This subclass is indented under subclass 514. Compositions wherein (1) a benzene ring is bonded directly to the additional -C(=O)- group, or (2) the -C(=O)O- group is attached indirectly to an additional nitrogen by nonionic bonding.

- (1) Note. Examples of components provided for herein are  $\text{CH}_3\text{CONHCH}_2\text{NHCOCH}_2\text{COONa}$  and



**516 Chalcogen attached indirectly to the -C(=O)O- group by nonionic bonding:**

This subclass is indented under subclass 459. Compositions wherein the -C(=O)O- is attached indirectly to chalcogen (i.e., oxygen,

sulfur, selenium, or tellurium) by nonionic bonding.

- (1) Note. An example of a component provided for herein is  $\text{C}_2\text{H}_5\text{COCOONa}$

**517 Plural carbons bonded directly to the chalcogen (e.g., ethers, etc.):**

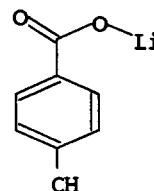
This subclass is indented under subclass 516. Compositions wherein the chalcogen is bonded directly to plural carbons.

- (1) Note. An example of a component provided for herein is  $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_2\text{COONa}$

**518 The chalcogen and the carbon of the -C(=O)O- group are bonded to a single benzene ring (e.g., salicylic acid salts, etc.):**

This subclass is indented under subclass 516. Compositions wherein the carbon of the -C(=O)O- group and the chalcogen are bonded to a single benzene ring.

- (1) Note. An example of a component provided for herein is



**519 The chalcogen is in an -OH group bonded to an acyclic carbon (wherein H of -OH may be replaced by metal, ammonium, or substituted ammonium; e.g., lithium-12-hydroxy stearate, saponified castor oil, etc.):**

This subclass is indented under subclass 516. Compositions wherein an acyclic carbon is bonded to the chalcogen, which is present as part of an -OH group (wherein the H of -OH may be replaced by metal, ammonium, or substituted ammonium).

- (1) Note. An example of a component provided for herein is lithium -12-hydroxy stearate.

- (2) Note. Saponified castor oil is provided for herein.
- 520 With ether or alcohol (except glycerin):**  
This subclass is indented under subclass 519. Compositions which contain, in addition to the -C(=O)O- compound, an alcohol (except glycerin) or an ether.
- (1) Note. Glycerin may be present in compositions of this subclass, provided that there is also present an ether or an alcohol that is not glycerin.
- 521 With organic nitrogen compound (which may be present as the amine salt of the acid), hydrocarbon polymer or halohydrocarbon polymer:**  
This subclass is indented under subclass 519. Compositions which contain, in addition to the -C(=O)O- compound, a polymeric hydrocarbon, a polymeric halohydrocarbon, or an organic nitrogen compound (which may be present as the organic nitrogen compound salt of the -C(=O)O- compound).
- (1) Note. An organic nitrogen compound is one wherein nitrogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 522 With hydrocarbon fatty acid or salt thereof, or complexes of such salt mixtures:**  
This subclass is indented under subclass 519. Compositions which contain, in addition to the -C(=O)O- compound, (1) a salt of a hydrocarbon fatty acid or a hydrocarbon fatty acid, per se, or (2) a complex formed from the -C(=O)O- compound and the hydrocarbon fatty acid salt or hydrocarbon fatty acid, per se.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
519, for compositions containing saponified castor oil.
- 523 Alkaline earth metal, aluminum, or heavy metal salt of the hydroxy carboxylic acid:**  
This subclass is indented under subclass 519. Compositions wherein the -C(=O)O- compound is in the form of a salt, the salifying agent being an alkaline earth metal, aluminum, or a heavy metal.
- (1) Note. Arsenic is considered as a heavy metal.
- (2) Note. Heavy metals are those with a specific gravity greater than 4.0.
- 524 Halogen attached indirectly to the -C(=O)O- group by nonionic bonding:**  
This subclass is indented under subclass 459. Compositions wherein the -C(=O)O- group is attached indirectly to halogen by nonionic bonding.
- (1) Note. An example of a component provided for herein is  $\text{Cl}_3\text{C}(\text{CH}_2)_{10}\text{COOH}$
- 525 Benzene ring bonded directly to the carbon of the -C(=O)O- group (e.g., aluminum complex salts, etc.):**  
This subclass is indented under subclass 459. Compositions wherein the carbon of the -C(=O)O- group is bonded directly to a benzene ring.
- (1) Note. An example of a component provided for herein is benzoic acid.
- 526 Benzene ring attached indirectly to the -C(=O)O- group by nonionic bonding (e.g., phenylstearate salts, etc.):**  
This subclass is indented under subclass 459. Compositions wherein the -C(=O)O- group is attached indirectly to a benzene ring by nonionic bonding.
- (1) Note. An example of a component provided for herein is the calcium salt of phenyl stearic acid.
- 527 Organic nitrogen salt of a carboxylic acid, or an organic nitrogen compound is present:**  
This subclass is indented under subclass 459. Compositions which (1) contain, in addition to the -C(=O)O- compound, an organic nitrogen compound, or (2) wherein the -C(=O)O- com-

- pound is in the form of an organic nitrogen compound salt of a carboxylic acid.
- (1) Note. An organic nitrogen compound is one wherein nitrogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
  - (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- 528 Having -C(=X)-, wherein X is chalcogen, attached directly to the nitrogen (e.g., amides, polyureas, etc.):**  
This subclass is indented under subclass 527. Compositions wherein the nitrogen is attached directly to -C(=X)-, wherein X is chalcogen (i.e., oxygen, sulfur, selenium, or tellurium).
- 529 Benzene ring bonded directly to the nitrogen:**  
This subclass is indented under subclass 527. Compositions wherein the nitrogen is bonded directly to a benzene ring.
- 530 The nitrogen is part of an alkanolamine:**  
This subclass is indented under subclass 527. Compositions wherein the organic nitrogen compound is an alkanolamine.
- (1) Note. An example of a component provided for herein is:  
  
$$\text{N}(\text{CH}_2\text{CH}_2\text{OH})_3,$$
  
  
which may be present as the cationic portion of a carboxylic acid salt.
- 531 With phenol or salt thereof:**  
This subclass is indented under subclass 459. Compositions which contain, in addition to the -C(=O)O- compound, a phenol or a salt of a phenol.
- 532 With ether or alcohol (except glycerin):**  
This subclass is indented under subclass 459. Compositions which contain, in addition to the -C(=O)O- compound, an alcohol (except glycerin) or an ether.
- (1) Note. Glycerin may be present in compositions of this subclass, provided that
- there is also present an ether or an alcohol that is not glycerin.
- 533 With organic halogen or sulfur compound:**  
This subclass is indented under subclass 459. Compositions which contain, in addition to the -C(=O)O- compound, an organic halogen or an organic sulfur compound.
- (1) Note. See Notes to the Class Definition for the definition of an organic compound.
  - (2) Note. An organic sulfur compound is one wherein sulfur is attached directly or indirectly by nonionic bonding to carbon of an organic compound. Similar considerations apply to an organic halogen compound.
- 534 With rubber, hydrocarbon polymer, petroleum resin, or hydrocarbon wax (e.g., polyisobutylene, etc.):**  
This subclass is indented under subclass 459. Compositions which contain, in addition to the -C(=O)O- compound, hydrocarbon wax, petroleum resin, polymeric hydrocarbon, or rubber.
- 535 Mixture of salt of carboxylic acid of six or fewer carbons with salt of carboxylic acid of more than six carbons, or complexes of such mixtures:**  
This subclass is indented under subclass 459. Compositions which contain (1) a salt of a carboxylic acid of six or fewer carbon atoms, and (2) a salt of a carboxylic acid of more than six carbons, or contain a complex formed from (1) and (2).
- 536 Mixture of carboxylic acid salts having different cations:**  
This subclass is indented under subclass 459. Compositions which contain carboxylic acid salts of more than one cation.
- 537 One of the cations is aluminum or heavy metal:**  
This subclass is indented under subclass 536. Compositions wherein heavy metal or aluminum is one of the cations.
- (1) Note. Arsenic is considered a heavy metal.

- (2) Note. Heavy metals are those whose specific gravity is greater than 4.0.
- 538 Naphthenic acid or salt thereof:**  
This subclass is indented under subclass 459. Compositions which contain a salt of a naphthenic acid or a naphthenic acid, per se.
- 539 Carboxylate salt, with no free acid present:**  
This subclass is indented under subclass 459. Compositions which contain a salt a carboxylic acid, but do not contain a free carboxylic acid.
- (1) Note. Examples of components provided for herein are alkaline earth metal carboxylates.
- 540 Compound of indeterminate structure, prepared by reacting a compound of known structure having halogen attached directly to phosphorus or chalcogen by nonionic bonding:**  
This subclass is indented under subclass 110. Compositions which contain a compound of indeterminate structure, prepared by reacting a compound of known structure having phosphorus or chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) attached directly to halogen by nonionic bonding.
- (1) Note. An example of a component provided for herein is the reaction product of a cyclized polymer of a polyolefin with phosphorus trichloride.
- 541 Organic selenium or tellurium compound:**  
This subclass is indented under subclass 110. Compositions which contain a compound wherein selenium or tellurium is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (1) Note. See Notes to the Class Definition for the definition of an organic compound.
- (2) Note. Examples of components provided for herein are  $C_2H_5-Se-C_2H_5$  and  $C_{12}H_{25}-Te-C_{12}H_{25}$ .
- 542 Compound of indeterminate structure, prepared by reacting an aldehyde, a phenol or phenol salt, and ammonia or substituted ammonia (e.g., reaction of formaldehyde, phenol, and amine, etc.):**  
This subclass is indented under subclass 110. Compositions which contain a compound of indeterminate structure which is prepared by reacting (1) ammonia or substituted ammonia, (2) a phenol or a phenol salt, and (3) an aldehyde.
- (1) Note. Many of the compounds of indeterminate structure provided for as components herein are the class of compounds known as Mannich bases. Many compounds which result from this type reaction, however, are of known structure. In this class, subclasses 556+ provide for many compounds of this type.
- 543 Compound of indeterminate structure, prepared by reacting an organic nitrogen compound of known structure:**  
This subclass is indented under subclass 110. Compositions which contain a compound of indeterminate structure prepared by the reaction of an organic nitrogen compound of known structure.
- (1) Note. An organic nitrogen compound is one wherein nitrogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (2) Note. See Notes to the Class Definition for the definition of an organic compound.
- (3) Note. An example of a component provided for herein is the product of indeterminate structure resulting from the reaction of a nitrosophenol with an alkylene polyamine.
- 544 An aldehyde is reacted with the organic nitrogen compound:**  
This subclass is indented under subclass 543. Compositions wherein the organic nitrogen compound is reacted with an aldehyde to yield the compound of indeterminate structure.

**545 Organic nitrogen compound:**

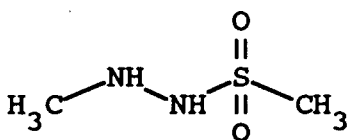
This subclass is indented under subclass 110. Compositions which contain a compound wherein nitrogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.

- (1) Note. See Notes to the Class Definition for the definition of an organic compound.
- (2) Note. An example of a component provided for herein is dicyclohexyl amine.

**546 Additional nitrogen bonded directly to the nitrogen (e.g., hydrazines, semicarbazones, etc.):**

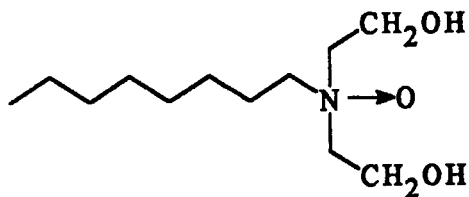
This subclass is indented under subclass 545. Compositions wherein the nitrogen is bonded directly to an additional nitrogen.

- (1) Note. An example of a component provided for herein is

**547 Quaternary ammonium salts or N-oxides:**

This subclass is indented under subclass 545. Compositions which contain an amine oxide or a quaternary ammonium compound.

- (1) Note. Examples of components provided for herein are

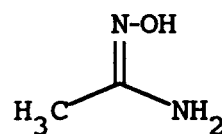


and

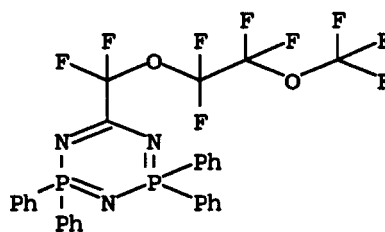
**548 Oxygen, sulfur, or phosphorus attached directly to the nitrogen by nonionic bonding:**

This subclass is indented under subclass 545. Compositions wherein the nitrogen is attached directly to phosphorus or to oxygen or sulfur by nonionic bonding.

- (1) Note. Examples of components provided for herein are



and

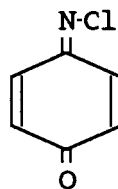
**549 Nitro or nitroso bonded directly to carbon:**

This subclass is indented under subclass 548. Compositions wherein carbon is bonded directly to a nitro or a nitroso group.

**550 Carbon double bonded directly to the nitrogen:**

This subclass is indented under subclass 545. Compositions wherein the nitrogen is double bonded directly to carbon.

- (1) Note. An example of a component provided for herein is



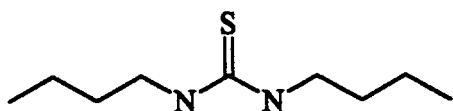
**551 Having -C(=X)- bonded directly to the nitrogen, wherein X is oxygen or sulfur:**

This subclass is indented under subclass 545. Compositions wherein -C(=X)-, wherein X is oxygen or sulfur, is bonded directly to the nitrogen.

**552 Additional nitrogen bonded directly to the -C(=X)- group (e.g., ureas, etc.):**

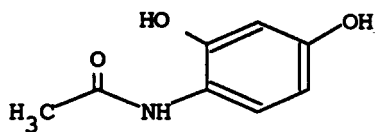
This subclass is indented under subclass 551. Compositions wherein the -C(=X)- group is further bonded directly to an additional nitrogen.

- (1) Note. An example of a component provided for herein is

**553 Having -OH substituted benzene ring bonded directly to the -C(=X)- or to the nitrogen (wherein H of -OH may be replaced by metal, ammonium, or substituted ammonium; e.g., salicylamides, etc.):**

This subclass is indented under subclass 551. Compositions wherein either the nitrogen or the -C(=X)- group is bonded directly to a benzene ring that is further substituted by -OH (wherein H of -OH may be replaced by metal, ammonium or substituted ammonium).

- (1) Note. An example of a component provided for herein is

**554 Plural nitrogens bonded directly to a single acyclic hydrocarbon chain (e.g., amides of ethylene diamine, etc.):**

This subclass is indented under subclass 551. Compositions wherein a single acyclic hydrocarbon chain is bonded directly to more than one nitrogen.

- (1) Note. An example of a component provided for herein is  
 $C_7H_{15}C(=O)NHCH_2CH_2NHCH_2CH_2NHC(=O)C_7H_{15}$

**555 Additional oxygen or sulfur attached indirectly to the nitrogen by acyclic nonionic bonding (e.g., oxamides, etc.):**

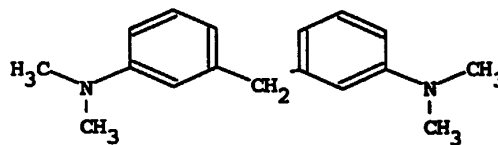
This subclass is indented under subclass 551. Compositions wherein the nitrogen is attached indirectly to an additional oxygen or sulfur by acyclic nonionic bonding.

- (1) Note. An example of a component provided for herein is  
 $HOCH_2CH_2CH_2CONHC_{11}H_{23}$

**556 Nitrogen attached indirectly to the nitrogen by nonionic bonding:**

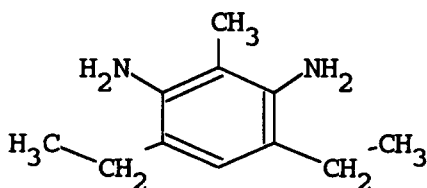
This subclass is indented under subclass 545. Compositions wherein the nitrogen is attached indirectly to an additional nitrogen by nonionic bonding.

- (1) Note. An example of a component provided for herein is

**557 Plural nitrogens bonded directly to a single benzene ring:**

This subclass is indented under subclass 556. Compositions wherein a single benzene ring is bonded directly to plural nitrogens.

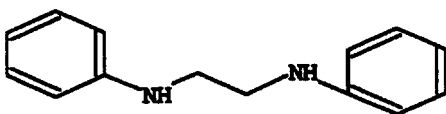
- (1) Note. An example of a component provided for herein is



**558 Plural nitrogens bonded directly to a single acyclic hydrocarbon chain:**

This subclass is indented under subclass 556. Compositions wherein a single acyclic hydrocarbon chain is bonded directly to plural nitrogens.

- (1) Note. An example of a component provided for herein is



**559 Oxygen or sulfur attached indirectly to the nitrogen by acyclic nonionic bonding:**

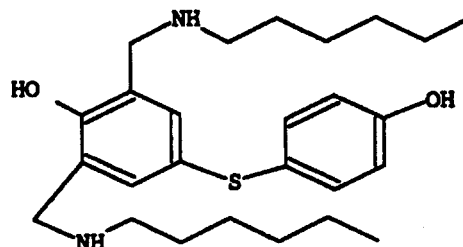
This subclass is indented under subclass 558. Compositions wherein the nitrogen is attached indirectly to oxygen or sulfur by acyclic nonionic bonding.

- (1) Note. An example of a component provided for herein is  $\text{NH}_2\text{-CH}_2\text{CH}_2\text{-NH-CH}_2\text{CH}_2\text{-OH}$

**560 Oxygen or sulfur bonded directly to a benzene ring (e.g., aniline disulfide, etc.):**

This subclass is indented under subclass 556. Compositions wherein a benzene ring is bonded directly to oxygen or sulfur.

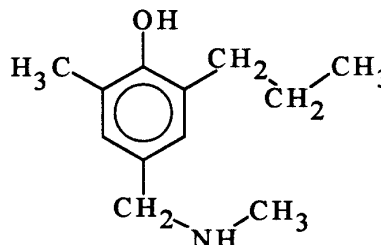
- (1) Note. An example of a component provided for herein is



**561 Oxygen or sulfur attached indirectly to the nitrogen by nonionic bonding:**

This subclass is indented under subclass 545. Compositions wherein the nitrogen is attached indirectly by nonionic bonding to oxygen or sulfur.

- (1) Note. An example of a component provided for herein is



**562 The oxygen or sulfur is attached indirectly to the nitrogen by acyclic nonionic bonding:**

This subclass is indented under subclass 561. Compositions wherein the nitrogen is attached indirectly to the oxygen or sulfur by acyclic nonionic bonding.

- (1) Note. An example of a component provided for herein is:  $\text{C}_2\text{H}_5\text{-S-CH}_2\text{CHOHCH}_2\text{-NHCH}_3$

**563 Benzene ring bonded directly to the nitrogen:**

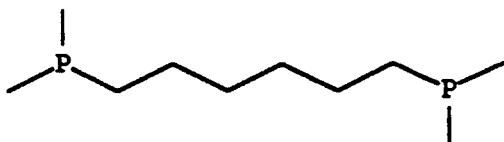
This subclass is indented under subclass 545. Compositions wherein the nitrogen is bonded directly to a benzene ring.

**564 Organic phosphorus compound:**

This subclass is indented under subclass 110. Compositions which contain a compound wherein phosphorus is attached directly or

indirectly by nonionic bonding to carbon of an organic compound.

- (1) Note. See Notes to the Class Definition for the definition of an organic compound.
- (2) Note. An example of a component provided for herein is



**565 Compound of indeterminate structure, prepared by reacting an organic sulfur compound of known structure:**

This subclass is indented under subclass 110. Compositions which contain a compound of indeterminate structure prepared by reacting a compound of known structure which has sulfur attached directly or indirectly by nonionic bonding to carbon of an organic compound.

- (1) Note. See Notes to the Class Definition for the definition of an organic compound.

**566 Compound of indeterminate structure, prepared by the reaction of a phenol, an aldehyde, and at least one of carbon disulfide, metal sulfide, or ammonium sulfide:**

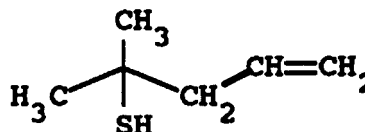
This subclass is indented under subclass 110. Compositions which contain a compound of indeterminate structure prepared by reacting (1) one of carbon disulfide, metal sulfide, or ammonium sulfide, (2) an aldehyde, and (3) a phenol.

**567 Organic sulfur compound (e.g., mercaptans, etc.):**

This subclass is indented under subclass 110. Compositions which contain a compound wherein sulfur is attached directly or indirectly by nonionic bonding to carbon of an organic compound.

- (1) Note. See Notes to the Class Definition for the definition of an organic compound.

- (2) Note. An example of a component provided for herein is



**568 Sulfur multiple bonded to another, different, atom (e.g., thioketones, sulfones, etc.):**

This subclass is indented under subclass 567. Compositions wherein another, different, atom is multiple bonded to sulfur.

- (1) Note. Examples of components provided for herein are  $\text{CH}_3\text{S}(=\text{O})\text{CH}_2\text{OH}$  and  $t\text{-Bu-S-S}(=\text{O})\text{-}t\text{-Bu}$

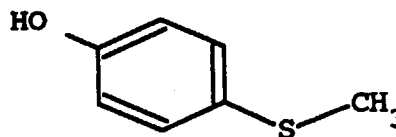
**569 Sulfides (i.e., plural carbons bonded directly to a single sulfur atom or sulfur chain):**

This subclass is indented under subclass 567. Compositions wherein the sulfur atom, or a chain of sulfur atoms of which the sulfur atom is a part, is bonded directly to plural carbons.

- (1) Note. Examples of components provided for herein are



and



**570 Halogen, oxygen, or additional sulfur attached indirectly to the sulfur atom or sulfur chain by acyclic nonionic bonding:**

This subclass is indented under subclass 569. Compositions wherein the sulfur atom or sulfur chain is attached indirectly by acyclic nonionic bonding to halogen, oxygen, or additional sulfur.

- (1) Note. An example of a component provided for herein is



**571 Benzene ring attached indirectly to the sulfur atom or sulfur chain by acyclic nonionic bonding:**

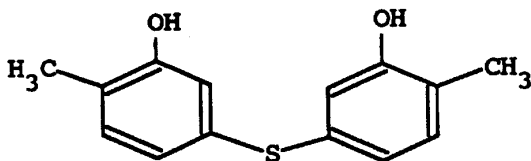
This subclass is indented under subclass 569. Compositions wherein the sulfur atom or sulfur chain is attached indirectly by acyclic nonionic bonding to a benzene ring.

- (1) Note. An example of a component provided for herein is  $\text{C}_6\text{H}_5\text{CH}_2\text{-S-S-CH}_2\text{C}_6\text{H}_5$

**572 Having plural -OH substituted benzene rings bonded directly to the sulfur atom or sulfur chain wherein H of -OH may be replaced by metal or ammonium; (e.g., sulfurized calcium alkylphenolates, etc.):**

This subclass is indented under subclass 569. Compositions wherein the sulfur atom or sulfur chain is bonded directly to plural benzene rings which are substituted by -OH (wherein H of -OH may be replaced by metal or ammonium).

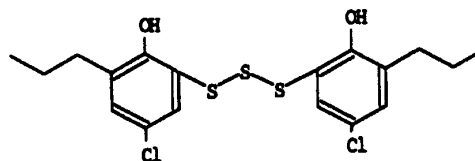
- (1) Note. An example of a component provided for herein is



**573 Halogen, a ring, carbonyl, or additional -OH bonded directly to one of the benzene rings:**

This subclass is indented under subclass 572. Compositions wherein one of the benzene rings is bonded directly to halogen, a ring, carbonyl, or an additional -OH.

- (1) Note. An example of a component provided for herein is



**574 Overbased or carbonated (e.g., overbased sulfurized phenates, etc.):**

This subclass is indented under subclass 572. Compositions wherein the organic sulfur compound is overbased or carbonated.

- (1) Note. An overbased compound herein is one in which an amount of metal (e.g., Mg, Ca, Ba, Sr) is present which is greater than the stoichiometric amount of metal which would be present if the phenolic sulfur compound were completely neutralized.
- (2) Note. A carbonated compound herein is the complex resulting from the reaction of carbon dioxide with metal phenate.

**575 Compound of indeterminate structure, prepared by reacting an organic oxygen compound of known structure:**

This subclass is indented under subclass 110. Compositions which contain a compound of indeterminate structure, prepared by the reaction of an organic oxygen compound of known structure.

- (1) Note. An example of a component provided for herein is the product of indeterminate structure prepared by the reaction of acetylacetone with stannic halide.
- (2) Note. An organic oxygen compound is one wherein oxygen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (3) Note. See Notes to the Class Definition for the definition of an organic compound.

**576 The organic oxygen compound of known structure is a carboxylic acid halide:**

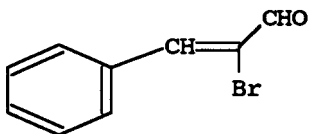
This subclass is indented under subclass 575. Compositions wherein a carboxylic acid halide is the organic oxygen compound of known structure.

- (1) Note. An example of a component provided for herein is the condensation product of sebacic acid dihalide and a petroleum fraction.

**577 Organic oxygen compound:**

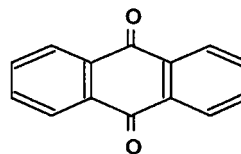
This subclass is indented under subclass 110. Compositions which contain a compound wherein oxygen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.

- (1) Note. See Notes to the Class Definition for the definition of an organic compound.
- (2) Note. An example of a component provided for herein is

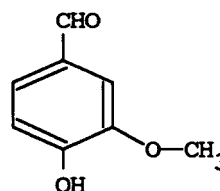
**578 Carbocyclic ring bonded directly to the carbon of a carbonyl group (e.g., phenyl ketones, anthraquinones, etc.):**

This subclass is indented under subclass 577. Compositions wherein a carbonyl group, -C(=O)-, is bonded directly to a carbocyclic ring.

- (1) Note. Examples of components provided for herein are



and

**579 Ethers:**

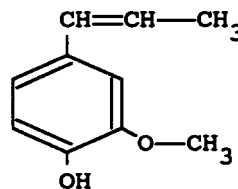
This subclass is indented under subclass 577. Compositions wherein an oxygen atom is bonded directly to two carbon atoms, i.e., is an ether oxygen.

- (1) Note. An example of a component provided for herein are polyoxyalkylene glycol.

**580 Ring bonded directly to the ether oxygen:**

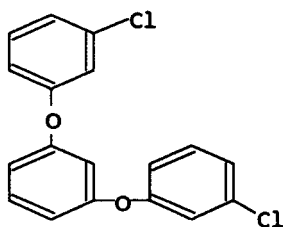
This subclass is indented under subclass 579. Compositions wherein the ether oxygen is bonded directly to a ring.

- (1) Note. An example of a component provided for herein is

**581 Two rings bonded directly to the ether oxygen:**

This subclass is indented under subclass 580. Compositions wherein the ether oxygen is bonded directly to two rings.

- (1) Note. An example of a component provided for herein is



**582 Halogen attached indirectly to the ether oxygen by nonionic bonding:**

This subclass is indented under subclass 579. Compositions wherein the ether oxygen is attached indirectly to halogen by nonionic bonding.

- (1) Note. An example of a component provided for herein is:  $\text{CF}_3\text{-O}(\text{CF}_2\text{CF}_2\text{O})_n\text{CF}_3$

**583 Having -OH bonded directly to carbon (wherein H of -OH may be replaced by metal or ammonium):**

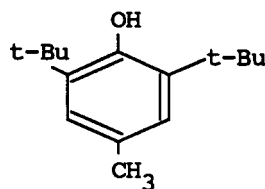
This subclass is indented under subclass 577. Compositions wherein carbon is bonded directly to -OH (wherein H of -OH may be replaced by metal or ammonium).

- (1) Note. An example of a component provided for herein is isopropanol.

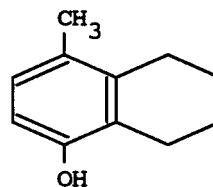
**584 Benzene ring bonded directly to the -OH group (e.g., beta-naphthol, etc.):**

This subclass is indented under subclass 583. Compositions wherein the -OH group is bonded directly to a benzene ring.

- (1) Note. Examples of components provided for herein are



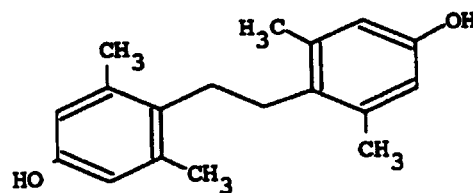
and



**585 Plural benzene rings bonded to each other, to the same acyclic carbon or to the same acyclic carbon chain (e.g., phenol-aldehyde condensates, etc.):**

This subclass is indented under subclass 584. Compositions wherein plural benzene rings are bonded to the same acyclic carbon, to the same acyclic carbon chain, or to each other.

- (1) Note. An example of a component provided for herein is



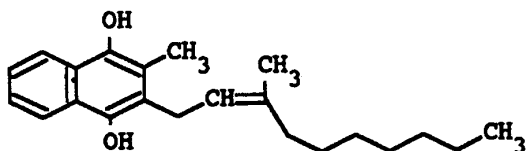
**586 The -OH group is in salt form:**

This subclass is indented under subclass 584. Compositions wherein the -OH group is salified (i.e., wherein H of -OH has been replaced by metal or ammonium).

**587 Halogen or additional -OH attached directly or indirectly to the benzene ring by nonionic bonding:**

This subclass is indented under subclass 584. Compositions wherein additional -OH or halogen is attached directly or indirectly to the benzene ring by nonionic bonding.

- (1) Note. An example of a component provided for herein is



- (3) Note. Hydrocarbon polymers prepared by addition polymerization of olefinic hydrocarbon monomers will be presumed to be solid unless otherwise stated.

END

**588 Organic halogen compound:**

This subclass is indented under subclass 110. Compositions which contain a compound wherein halogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.

- (1) Note. See Notes to the Class Definition for the definition of an organic compound.
- (2) Note. An example of a component provided for herein is tetrachlorobenzene.

**589 Halogenated acyclic compound or halogenated petroleum fraction:**

This subclass is indented under subclass 588. Compositions wherein an acyclic compound is halogenated or a petroleum fraction is halogenated.

**590 Fluorinated acyclic compound or fluorinated petroleum fraction (e.g., trifluorochloroethylene telomer, etc.):**

This subclass is indented under subclass 589. Compositions wherein an acyclic compound is fluorinated or a petroleum fraction is fluorinated.

**591 Solid hydrocarbon polymer:**

This subclass is indented under subclass 110. Compositions which contain a polymeric component which is both solid and hydrocarbonaceous.

- (1) Note. The polymers provided for herein can be homopolymeric or copolymeric.
- (2) Note. An example of a component provided for herein is: polycyclopentadiene.